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NUCLEIC ACID AND AMINO ACID SEQUENCES RELATING TO  
STAPHYLOCOCCUS EPIDERMIDIS FOR DIAGNOSTICS AND THERAPEUTICS

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Related Applications:

This application claims priority of U.S. Provisional Application 60/055,779, filed August 14, 1997 and U.S. Provisional Application 60/064,964, filed November 8, 1997 all of  
10 which is hereby incorporated herein by reference in their entirety.

Field Of The Invention:

The invention relates to isolated nucleic acids and polypeptides derived from Staphylococcus epidermidis that are useful as molecular targets for diagnostics,  
15 prophylaxis and treatment of pathological conditions, as well as materials and methods for the diagnosis, prevention, and amelioration of pathological conditions resulting from bacterial infection.

Background Of The Invention:

20 Staphylococcus epidermidis (*S. epidermidis*) is a species of staphylococcal bacteria that are Gram-positive, nonmotile, nonpigmented and coagulase-negative cocci, which are mainly found on the skin and mucous membrane of warm-blooded animals. Their large numbers and ubiquitous distribution result in frequent contamination of specimens collected from or through the skin, making these organisms amongst the most  
25 frequently isolated in the clinical laboratory. In the past, *S. epidermidis* was rarely the cause of significant infections, but with the increasing use of implanted catheters and prosthetic devices, it has emerged as an important agent of hospital-acquired infections and has been recognized as a true pathogen (Lowy and Hammer, 1983, Ann Intern Med, 99: 834-9; Blum and Rodvold, 1987, Clin Pharm, 6: 464-75; Hamory, Parisi et al., 1987,  
30 Am J Infect Control, 15: 59-74). *S. epidermidis* is a major cause of infection of indwelling foreign devices such as, orthopedic devices, intravenous catheters, prosthetic

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heart valves, central nervous system shunts, and peritoneal dialysis catheters (Blum and Rodvold, 1987, Clin Pharm, 6: 464-75; Archer, 1988, J Antimicrob Chemother, 21 Suppl C: 133-8)(Lowy and Hammer, 1983, Ann Intern Med, 99: 834-9; Hamory, Parisi et al., Staphylococcus 1987, Am J Infect Control, 15: 59-74). In addition *S. epidermidis* is a common cause of postoperative wound infections, bacteremia of immunosuppressed patients, intensive-care unit patients and premature newborns (MacLowry, 1983, Am J Med, 75: 2-6)(Eykyn, 1988, Lancet, 1: 100-4). According to a national survey (Centers for Disease Control, 1981:7) *S. epidermidis* caused 8.9% of primary nosocomial bacteremias.

10 Treatment of *S. epidermidis* infections remains difficult because of the occult nature, association with foreign bodies, and frequent resistance to antimicrobial agents. Ordinarily, *S. epidermidis* is an organism with low virulence, however breaks in host defense caused by surgery, catheter placement, prosthesis insertion or immuno-suppression is prerequisite for infection. The presence of foreign bodies itself facilitates infection by protecting the organism from elimination by host defenses or antimicrobial therapy (Lowy and Hammer, 1983, Ann Intern Med, 99: 834-9). Furthermore, *S. epidermidis* due to its ability to produce extracellular polysaccharide material or slime, may be uniquely adapted to adhere to smooth surfaces such as plastics or metal. Slime producing strains of *S. epidermidis* appear to be more pathogenic than non-slime producing strains (Christensen, Simpson et al., 1983, Infect Immun, 40: 407-10; Peters and Pulverer, 1984, J Antimicrob Chemother, 14 Suppl D: 67-71; Gallimore, Gagnon et al., 1991, J Infect Dis, 164: 1220-3). This property and many factors are involved in the pathogenesis of device associated infections. Despite the increased recognition as a pathogen, *S. epidermidis* infections are difficult to diagnose. Differentiating clinically important from clinically unimportant bacterial isolates of *S. epidermidis* is difficult because of the high rate of contamination.

Although laboratory isolates of *S. epidermidis* have generally been susceptible to semisynthetic penicillins (methicillin, nafcillin, oxacillin), cephalosporins, aminoglycosides, vancomycin and rifampin, recent clinical isolates have had an increased resistance. Recent reports (Karchmer, 1985, Am J Med, 78: 116-27; Karchmer, 1991, J Hosp Infect, 18 Suppl A: 355-66) show that 83% of *S. epidermidis* isolates from patients



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with prosthetic valve endocarditis are methicillin resistant and 32% are gentamicin resistant as well. Multi-drug resistant staphylococci have emerged in the midst of high level use of penicillin and aminoglycosides (Centers for Disease Control and Prevention, 1993 MMWR 42:597; and S. Handwerger et al., 1993, Clin Infect Dis 16:750).

5           The use of antibiotics for therapeutics and prophylactic purposes, promotes the selection of resistant organisms and the spread of antibiotic resistance genes among bacteria. Previous studies have shown that virtually all staphylococci carry some antibiotic resistance genes on naturally occurring extrachromosomal mobile genetic elements, such as the plasmids. Survey and analysis of plasmids in clinical isolates of *S.*  
10 *epidermidis* have shown that more than 80% of isolates carry plasmids and in several cases more than one plasmid (Archer et al., 1982, Infect Immun, 35:627-632; Kloos et al., 1981, Can J Microbiol, 27:271-278; Moller, 1988, J Hosp Infect 12:19-27). Though the most important forms of resistance has been the inactivation of antibiotics, particularly penicillins and cephalosporins, recent clinical isolates have resistance to one or more of  
15 the following antibiotics, methicillin, tetracycline, erythromycin, gentamycin, kanamycin and chloramphenicol. In fact due to the wide spread occurrence of plasmids and their involvement in antibiotic resistance, plasmid profiling has been used as an epidemiological reagent to study nosocomial infections. This invention relates to isolated nucleic acids and polypeptides derived from *S. epidermidis* plasmids that are useful as  
20 molecular targets for diagnosis, prophylaxis and treatment of pathological conditions, as well as materials and methods for the diagnosis, prevention, and amelioration of pathological conditions resulting from bacterial infection.

These concerns point to the need for diagnostic tools and therapeutics aimed at proper identification of strain and eradication of virulence. The design of vaccines that  
25 will limit the spread of infection and halt transfer of resistance factors is very desirable.

#### Summary Of The Invention:

The present invention fulfills the need for diagnostic tools and therapeutics by providing bacterial-specific compositions and methods for detecting, treating, and  
30 preventing bacterial infection, in particular *S. epidermidis* infection.

The present invention encompasses isolated nucleic acids and polypeptides derived from *S. epidermidis* that are useful as reagents for diagnosis of bacterial disease, components of effective antibacterial vaccines, and/or as targets for antibacterial drugs including anti-*S. epidermidis* drugs. They can also be used to detect the presence of *S.*  
5 *epidermidis* and other *Staphylococcus* species in a sample; and in screening compounds for the ability to interfere with the *S. epidermidis* life cycle or to inhibit *S. epidermidis* infection. They also has use as biocontrol agents for plants.

More specifically, this invention features compositions of nucleic acids corresponding to entire coding sequences of *S. epidermidis* proteins, including surface or  
10 secreted proteins or parts thereof, nucleic acids capable of binding mRNA from *S. epidermidis* proteins to block protein translation, and methods for producing *S. epidermidis* proteins or parts thereof using peptide synthesis and recombinant DNA techniques. This invention also features antibodies and nucleic acids useful as probes to detect *S. epidermidis* infection. In addition, vaccine compositions and methods for the  
15 protection or treatment of infection by *S. epidermidis* are within the scope of this invention.

The nucleotide sequences provided in SEQ ID NO: 1 - SEQ ID NO: 2837, a fragment thereof, or a nucleotide sequence at least 99.5% identical to SEQ ID NO: 1 - SEQ ID NO: 2837 may be "provided" in a variety of medias to facilitate use thereof. As  
20 used herein, "provided" refers to a manufacture, other than an isolated nucleic acid molecule, which contains a nucleotide sequence of the present invention, i.e., the nucleotide sequence provided in SEQ ID NO: 1 - SEQ ID NO: 2837, a fragment thereof, or a nucleotide sequence at least 99.5% identical to a sequence contained within SEQ ID NO: 1 - SEQ ID NO: 2837. Uses for and methods for providing nucleotide sequences in a  
25 variety of media is well known in the art (see e.g., EPO Publication No. EP 0 756 006).

In one application of this embodiment, a nucleotide sequence of the present invention can be recorded on computer readable media. As used herein, "computer readable media" refers to any media which can be read and accessed directly by a  
30 computer. Such media include, but are not limited to: magnetic storage media, such as floppy discs, hard disc storage media, and magnetic tape; optical storage media such as CD-ROM; electrical storage media such as RAM and ROM; and hybrids of these

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categories such as magnetic/optical storage media. A person skilled in the art can readily appreciate how any of the presently known computer readable media can be used to create a manufacture comprising computer readable media having recorded thereon a nucleotide sequence of the present invention.

5           As used herein, "recorded" refers to a process for storing information on computer readable media. A person skilled in the art can readily adopt any of the presently known methods for recording information on computer readable media to generate manufactures comprising the nucleotide sequence information of the present invention.

10           A variety of data storage structures are available to a person skilled in the art for creating a computer readable media having recorded thereon a nucleotide sequence of the present invention. The choice of the data storage structure will generally be based on the means chosen to access the stored information. In addition, a variety of data processor programs and formats can be used to store the nucleotide sequence information of the  
15           present invention on computer readable media. The sequence information can be represented in a word processing text file, formatted in commercially-available software such as WordPerfect and Microsoft Word, or represented in the form of an ASCII file, stored in a database application, such as DB2, Sybase, Oracle, or the like. A person skilled in the art can readily adapt any number of data processor structuring formats (e.g.  
20           text file or database) in order to obtain computer readable media having recorded thereon the nucleotide sequence information of the present invention.

          By providing the nucleotide sequence of SEQ ID NO: 1 - SEQ ID NO: 2837, a fragment thereof, or a nucleotide sequence at least 99.5% identical to SEQ ID NO: 1 - SEQ ID NO: 2837 in computer readable form, a person skilled in the art can routinely  
25           access the coding sequence information for a variety of purposes. Computer software is publicly available which allows a person skilled in the art to access sequence information provided in a computer readable media. Examples of such computer software include programs of the "Staden Package", "DNA Star", "MacVector", GCG "Wisconsin Package" (Genetics Computer Group, Madison, WI) and "NCBI Toolbox" (National  
30           Center For Biotechnology Information)..

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Computer algorithms enable the identification of *S. epidermidis* open reading frames (ORFs) within SEQ ID NO: 1 - SEQ ID NO: 2837 which contain homology to ORFs or proteins from other organisms. Examples of such similarity-search algorithms include the BLAST [Altschul et al., J. Mol. Biol. 215:403-410 (1990)] and Smith-  
5 Waterman [Smith and Waterman (1981) Advances in Applied Mathematics, 2:482-489] search algorithms. These algorithms are utilized on computer systems as exemplified below. The ORFs so identified represent protein encoding fragments within the *S. epidermidis* genome and are useful in producing commercially important proteins such as enzymes used in fermentation reactions and in the production of commercially useful  
10 metabolites.

The present invention further provides systems, particularly computer-based systems, which contain the sequence information described herein. Such systems are designed to identify commercially important fragments of the *S. epidermidis* genome. As used herein, "a computer-based system" refers to the hardware means, software means,  
15 and data storage means used to analyze the nucleotide sequence information of the present invention. The minimum hardware means of the computer-based systems of the present invention comprises a central processing unit (CPU), input means, output means, and data storage means. A person skilled in the art can readily appreciate that any one of the currently available computer-based systems is suitable for use in the present  
20 invention. The computer-based systems of the present invention comprise a data storage means having stored therein a nucleotide sequence of the present invention and the necessary hardware means and software means for supporting and implementing a search means. As used herein, "data storage means" refers to memory which can store nucleotide sequence information of the present invention, or a memory access means  
25 which can access manufactures having recorded thereon the nucleotide sequence information of the present invention.

As used herein, "search means" refers to one or more programs which are implemented on the computer-based system to compare a target sequence or target structural motif with the sequence information stored within the data storage means.  
30 Search means are used to identify fragments or regions of the *S. epidermidis* genome which are similar to, or "match", a particular target sequence or target motif. A variety of

known algorithms are known in the art and have been disclosed publicly, and a variety of commercially available software for conducting homology-based similarity searches are available and can be used in the computer-based systems of the present invention.

Examples of such software includes, but is not limited to, FASTA (GCG Wisconsin  
5 Package), Bic\_SW (Compugen Bioccelerator), BLASTN2, BLASTP2, BLASTX2  
(NCBI) and Motifs (GCG). A person skilled in the art can readily recognize that any one  
of the available algorithms or implementing software packages for conducting homology  
searches can be adapted for use in the present computer- based systems.

As used herein, a "target sequence" can be any DNA or amino acid sequence of  
10 six or more nucleotides or two or more amino acids. A person skilled in the art can  
readily recognize that the longer a target sequence is, the less likely a target sequence will  
be present as a random occurrence in the database. The most preferred sequence length of  
a target sequence is from about 10 to 100 amino acids or from about 30 to 300 nucleotide  
residues. However, it is well recognized that many genes are longer than 500 amino  
15 acids, or 1.5 kb in length, and that commercially important fragments of the S.  
epidermidis genome, such as sequence fragments involved in gene expression and  
protein processing, will often be shorter than 30 nucleotides.

As used herein, "a target structural motif," or "target motif," refers to any  
rationally selected sequence or combination of sequences in which the sequence(s) are  
20 chosen based on a specific functional domain or three-dimensional configuration which is  
formed upon the folding of the target polypeptide. There are a variety of target motifs  
known in the art. Protein target motifs include, but are not limited to, enzymatic active  
sites, membrane-spanning regions, and signal sequences. Nucleic acid target motifs  
include, but are not limited to, promoter sequences, hairpin structures and inducible  
25 expression elements (protein binding sequences).

A variety of structural formats for the input and output means can be used to input  
and output the information in the computer-based systems of the present invention. A  
preferred format for an output means ranks fragments of the S. epidermidis genome  
possessing varying degrees of homology to the target sequence or target motif. Such  
30 presentation provides a person skilled in the art with a ranking of sequences which

contain various amounts of the target sequence or target motif and identifies the degree of homology contained in the identified fragment.

A variety of comparing means can be used to compare a target sequence or target motif with the data storage means to identify sequence fragments of the *S. epidermidis* genome. In the present examples, implementing software which implement the BLASTP2 and bic\_SW algorithms (Altschul et al., J Mol. Biol. 215:403-410 (1990); Compugen Biocellator) was used to identify open reading frames within the *S. epidermidis* genome. A person skilled in the art can readily recognize that any one of the publicly available homology search programs can be used as the search means for the computer-based systems of the present invention.

The invention features *S. epidermidis* polypeptides, preferably a substantially pure preparation of a *S. epidermidis* polypeptide, or a recombinant *S. epidermidis* polypeptide. In preferred embodiments: the polypeptide has biological activity; the polypeptide has an amino acid sequence at least 60%, 70%, 80%, 90%, 95%, 98%, or 99% identical to an amino acid sequence of the invention contained in the Sequence Listing, preferably it has about 65% sequence identity with an amino acid sequence of the invention contained in the Sequence Listing, and most preferably it has about 92% to about 99% sequence identity with an amino acid sequence of the invention contained in the Sequence Listing; the polypeptide has an amino acid sequence essentially the same as an amino acid sequence of the invention contained in the Sequence Listing; the polypeptide is at least 5, 10, 20, 50, 100, or 150 amino acid residues in length; the polypeptide includes at least 5, preferably at least 10, more preferably at least 20, more preferably at least 50, 100, or 150 contiguous amino acid residues of the invention contained in the Sequence Listing. In yet another preferred embodiment, the amino acid sequence which differs in sequence identity by about 7% to about 8% from the *S. epidermidis* amino acid sequences of the invention contained in the Sequence Listing is also encompassed by the invention.

In preferred embodiments: the *S. epidermidis* polypeptide is encoded by a nucleic acid of the invention contained in the Sequence Listing, or by a nucleic acid having at least 60%, 70%, 80%, 90%, 95%, 98%, or 99% homology with a nucleic acid of the invention contained in the Sequence Listing.

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In a preferred embodiment, the subject *S. epidermidis* polypeptide differs in amino acid sequence at 1, 2, 3, 5, 10 or more residues from a sequence of the invention contained in the Sequence Listing. The differences, however, are such that the *S. epidermidis* polypeptide exhibits a *S. epidermidis* biological activity, e.g., the *S. epidermidis* polypeptide retains a biological activity of a naturally occurring *S. epidermidis* enzyme.

In preferred embodiments, the polypeptide includes all or a fragment of an amino acid sequence of the invention contained in the Sequence Listing; fused, in reading frame, to additional amino acid residues, preferably to residues encoded by genomic DNA 5' or 3' to the genomic DNA which encodes a sequence of the invention contained in the Sequence Listing.

In yet other preferred embodiments, the *S. epidermidis* polypeptide is a recombinant fusion protein having a first *S. epidermidis* polypeptide portion and a second polypeptide portion, e.g., a second polypeptide portion having an amino acid sequence unrelated to *S. epidermidis*. The second polypeptide portion can be, e.g., any of glutathione-S-transferase, a DNA binding domain, or a polymerase activating domain. In preferred embodiment the fusion protein can be used in a two-hybrid assay.

Polypeptides of the invention include those which arise as a result of alternative transcription events, alternative RNA splicing events, and alternative translational and postranslational events.

In a preferred embodiment, the encoded *S. epidermidis* polypeptide differs (e.g., by amino acid substitution, addition or deletion of at least one amino acid residue) in amino acid sequence at 1, 2, 3, 5, 10 or more residues, from a sequence of the invention contained in the Sequence Listing. The differences, however, are such that: the *S. epidermidis* encoded polypeptide exhibits a *S. epidermidis* biological activity, e.g., the encoded *S. epidermidis* enzyme retains a biological activity of a naturally occurring *S. epidermidis*.

In preferred embodiments, the encoded polypeptide includes all or a fragment of an amino acid sequence of the invention contained in the Sequence Listing; fused, in reading frame, to additional amino acid residues, preferably to residues encoded by

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genomic DNA 5' or 3' to the genomic DNA which encodes a sequence of the invention contained in the Sequence Listing.

The *S. epidermidis* strain, from which the nucleotide sequences have been sequenced, was deposited on July 10, 1997 in the American Type Culture Collection  
5 (ATCC #55998) as strain 18972.

Included in the invention are: allelic variations; natural mutants; induced mutants; proteins encoded by DNA that hybridize under high or low stringency conditions to a nucleic acid which encodes a polypeptide of the invention contained in the Sequence Listing (for definitions of high and low stringency see Current Protocols in  
10 Molecular Biology, John Wiley & Sons, New York, 1989, 6.3.1 - 6.3.6, hereby incorporated by reference); and, polypeptides specifically bound by antisera to *S. epidermidis* polypeptides, especially by antisera to an active site or binding domain of *S. epidermidis* polypeptide. The invention also includes fragments, preferably biologically active fragments. These and other polypeptides are also referred to herein as *S.*  
15 *epidermidis* polypeptide analogs or variants.

The invention further provides nucleic acids, e.g., RNA or DNA, encoding a polypeptide of the invention. This includes double stranded nucleic acids as well as coding and antisense single strands.

In preferred embodiments, the subject *S. epidermidis* nucleic acid will include a  
20 transcriptional regulatory sequence, e.g. at least one of a transcriptional promoter or transcriptional enhancer sequence, operably linked to the *S. epidermidis* gene sequence, e.g., to render the *S. epidermidis* gene sequence suitable for expression in a recombinant host cell.

In yet a further preferred embodiment, the nucleic acid which encodes a *S.*  
25 *epidermidis* polypeptide of the invention, hybridizes under stringent conditions to a nucleic acid probe corresponding to at least 8 consecutive nucleotides of the invention contained in the Sequence Listing; more preferably to at least 12 consecutive nucleotides of the invention contained in the Sequence Listing; more preferably to at least 20 consecutive nucleotides of the invention contained in the Sequence Listing; more  
30 preferably to at least 40 consecutive nucleotides of the invention contained in the Sequence Listing.



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In another aspect, the invention provides a substantially pure nucleic acid having a nucleotide sequence which encodes a *S. epidermidis* polypeptide. In preferred embodiments: the encoded polypeptide has biological activity; the encoded polypeptide has an amino acid sequence at least 60%, 70%, 80%, 90%, 95%, 98%, or 99%

5 homologous to an amino acid sequence of the invention contained in the Sequence Listing; the encoded polypeptide has an amino acid sequence essentially the same as an amino acid sequence of the invention contained in the Sequence Listing; the encoded polypeptide is at least 5, 10, 20, 50, 100, or 150 amino acids in length; the encoded polypeptide comprises at least 5, preferably at least 10, more preferably at least 20, more  
10 preferably at least 50, 100, or 150 contiguous amino acids of the invention contained in the Sequence Listing.

In another aspect, the invention encompasses: a vector including a nucleic acid which encodes a *S. epidermidis* polypeptide or a *S. epidermidis* polypeptide variant as described herein; a host cell transfected with the vector; and a method of producing a  
15 recombinant *S. epidermidis* polypeptide or *S. epidermidis* polypeptide variant; including culturing the cell, e.g., in a cell culture medium, and isolating a *S. epidermidis* or *S. epidermidis* polypeptide variant, e.g., from the cell or from the cell culture medium.

One embodiment of the invention is directed to substantially isolated nucleic acids. Nucleic acids of the invention include sequences comprising at least about 8  
20 nucleotides in length, more preferably at least about 12 nucleotides in length, even more preferably at least about 15-20 nucleotides in length, that correspond to a subsequence of any one of SEQ ID NO: 1 - SEQ ID NO: 2837 or complements thereof. Alternatively, the nucleic acids comprise sequences contained within any ORF (open reading frame), including a complete protein-coding sequence, of which any of SEQ ID NO: 1 - SEQ ID  
25 NO: 2837 forms a part. The invention encompasses sequence-conservative variants and function-conservative variants of these sequences. The nucleic acids may be DNA, RNA, DNA/RNA duplexes, protein-nucleic acid (PNA), or derivatives thereof.

In another aspect, the invention features, a purified recombinant nucleic acid having at least 50%, 60%, 70%, 80%, 90%, 95%, 98%, or 99% homology with a  
30 sequence of the invention contained in the Sequence Listing

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The invention also encompasses recombinant DNA (including DNA cloning and expression vectors) comprising these *S. epidermidis*-derived sequences; host cells comprising such DNA, including fungal, bacterial, yeast, plant, insect, and mammalian host cells; and methods for producing expression products comprising RNA and polypeptides encoded by the *S. epidermidis* sequences. These methods are carried out by incubating a host cell comprising a *S. epidermidis*-derived nucleic acid sequence under conditions in which the sequence is expressed. The host cell may be native or recombinant. The polypeptides can be obtained by (a) harvesting the incubated cells to produce a cell fraction and a medium fraction; and (b) recovering the *S. epidermidis* polypeptide from the cell fraction, the medium fraction, or both. The polypeptides can also be made by in vitro translation.

In another aspect, the invention features nucleic acids capable of binding mRNA of *S. epidermidis*. Such nucleic acid is capable of acting as antisense nucleic acid to control the translation of mRNA of *S. epidermidis*. A further aspect features a nucleic acid which is capable of binding specifically to a *S. epidermidis* nucleic acid. These nucleic acids are also referred to herein as complements and have utility as probes and as capture reagents.

In another aspect, the invention features an expression system comprising an open reading frame corresponding to *S. epidermidis* nucleic acid. The nucleic acid further comprises a control sequence compatible with an intended host. The expression system is useful for making polypeptides corresponding to *S. epidermidis* nucleic acid.

In another aspect, the invention encompasses: a vector including a nucleic acid which encodes a *S. epidermidis* polypeptide or a *S. epidermidis* polypeptide variant as described herein; a host cell transfected with the vector; and a method of producing a recombinant *S. epidermidis* polypeptide or *S. epidermidis* polypeptide variant; including culturing the cell, e.g., in a cell culture medium, and isolating the *S. epidermidis* or *S. epidermidis* polypeptide variant, e.g., from the cell or from the cell culture medium.

In yet another embodiment of the invention encompasses reagents for detecting bacterial infection, including *S. epidermidis* infection, which comprise at least one *S. epidermidis*-derived nucleic acid defined by any one of SEQ ID NO: 1 - SEQ ID NO:

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2837, or sequence-conservative or function-conservative variants thereof. Alternatively, the diagnostic reagents comprise polypeptide sequences that are contained within any open reading frames (ORFs), including complete protein-coding sequences, contained within any of SEQ ID NO: 1 - SEQ ID NO: 2837, or polypeptide sequences contained  
5 within any of SEQ ID NO: 2838 - SEQ ID NO: 5674, or polypeptides of which any of the above sequences forms a part, or antibodies directed against any of the above peptide sequences or function-conservative variants and/or fragments thereof.

The invention further provides antibodies, preferably monoclonal antibodies, which specifically bind to the polypeptides of the invention. Methods are also provided  
10 for producing antibodies in a host animal. The methods of the invention comprise immunizing an animal with at least one *S. epidermidis*-derived immunogenic component, wherein the immunogenic component comprises one or more of the polypeptides encoded by any one of SEQ ID NO: 1 - SEQ ID NO: 2837 or sequence-conservative or function-conservative variants thereof; or polypeptides that are contained within any  
15 ORFs, including complete protein-coding sequences, of which any of SEQ ID NO: 1 - SEQ ID NO: 2837 forms a part; or polypeptide sequences contained within any of SEQ ID NO: 2838 - SEQ ID NO: 5674, or polypeptides of which any of SEQ ID NO: 2838 - SEQ ID NO: 5674 forms a part. Host animals include any warm blooded animal, including without limitation mammals and birds. Such antibodies have utility as  
20 reagents for immunoassays to evaluate the abundance and distribution of *S. epidermidis*-specific antigens.

In yet another aspect, the invention provides diagnostic methods for detecting *S. epidermidis* antigenic components or anti-*S. epidermidis* antibodies in a sample. *S. epidermidis* antigenic components are detected by a process comprising: (i) contacting a  
25 sample suspected to contain a bacterial antigenic component with a bacterial-specific antibody, under conditions in which a stable antigen-antibody complex can form between the antibody and bacterial antigenic components in the sample; and (ii) detecting any antigen-antibody complex formed in step (i), wherein detection of an antigen-antibody complex indicates the presence of at least one bacterial antigenic component in the  
30 sample. In different embodiments of this method, the antibodies used are directed against a sequence encoded by any of SEQ ID NO: 1 - SEQ ID NO: 2837 or sequence-

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conservative or function-conservative variants thereof, or against a polypeptide sequence contained in any of SEQ ID NO: 2838 - SEQ ID NO: 5674 or function-conservative variants thereof.

In yet another aspect, the invention provides a method for detecting antibacterial-specific antibodies in a sample, which comprises: (i) contacting a sample suspected to contain antibacterial-specific antibodies with a *S. epidermidis* antigenic component, under conditions in which a stable antigen-antibody complex can form between the *S. epidermidis* antigenic component and antibacterial antibodies in the sample; and (ii) detecting any antigen-antibody complex formed in step (i), wherein detection of an antigen-antibody complex indicates the presence of antibacterial antibodies in the sample. In different embodiments of this method, the antigenic component is encoded by a sequence contained in any of SEQ ID NO: 1 - SEQ ID NO: 2837 or sequence-conservative and function-conservative variants thereof, or is a polypeptide sequence contained in any of SEQ ID NO: 2838 - SEQ ID NO: 5674 or function-conservative variants thereof.

In another aspect, the invention features a method of generating vaccines for immunizing an individual against *S. epidermidis*. The method includes: immunizing a subject with a *S. epidermidis* polypeptide, e.g., a surface or secreted polypeptide, or a combination of such peptides or active portion(s) thereof, and a pharmaceutically acceptable carrier. Such vaccines have therapeutic and prophylactic utilities.

In another aspect, the invention features a method of evaluating a compound, e.g. a polypeptide, e.g., a fragment of a host cell polypeptide, for the ability to bind a *S. epidermidis* polypeptide. The method includes: contacting the *Staphylococcus* compound with a *S. epidermidis* polypeptide and determining if the compound binds or otherwise interacts with a *S. epidermidis* polypeptide. Compounds which bind *S. epidermidis* are candidates as activators or inhibitors of the bacterial life cycle. These assays can be performed in vitro or in vivo.

In another aspect, the invention features a method of evaluating a compound, e.g. a polypeptide, e.g., a fragment of a host cell polypeptide, for the ability to bind a *S. epidermidis* nucleic acid, e.g., DNA or RNA. The method includes: contacting the *Staphylococcus* compound with a *S. epidermidis* nucleic acid and determining if the

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compound binds or otherwise interacts with a *S. epidermidis* polypeptide. Compounds which bind *S. epidermidis* are candidates as activators or inhibitors of the bacterial life cycle. These assays can be performed in vitro or in vivo.

5 A particularly preferred embodiment of the invention is directed to a method of screening test compounds for anti-bacterial activity, which method comprises: selecting as a target a bacterial specific sequence, which sequence is essential to the viability of a bacterial species; contacting a test compound with said target sequence; and selecting those test compounds which bind to said target sequence as potential anti-bacterial candidates. In one embodiment, the target sequence selected is specific to a single  
10 species, or even a single strain, i.e., the *S. epidermidis* 18972. In a second embodiment, the target sequence is common to at least two species of bacteria. In a third embodiment, the target sequence is common to a family of bacteria. The target sequence may be a nucleic acid sequence or a polypeptide sequence. Methods employing sequences common to more than one species of microorganism may be used to screen candidates for  
15 broad spectrum anti-bacterial activity.

The invention also provides methods for preventing or treating disease caused by certain bacteria, including *S. epidermidis*, which are carried out by administering to an animal in need of such treatment, in particular a warm-blooded vertebrate, including but not limited to birds and mammals, a compound that specifically inhibits or interferes with  
20 the function of a bacterial polypeptide or nucleic acid. In a particularly preferred embodiment, the mammal to be treated is human.

#### DETAILED DESCRIPTION OF THE INVENTION

The sequences of the present invention include the specific nucleic acid and  
25 amino acid sequences set forth in the Sequence Listing that forms a part of the present specification, and which are designated SEQ ID NO: 1 - SEQ ID NO: 5674. Use of the terms "SEQ ID NO: 1 - SEQ ID NO: 2837," "SEQ ID NO: 2838 - SEQ ID NO: 5674," and "the sequences depicted in Table 2", etc., is intended, for convenience, to refer to each individual SEQ ID NO individually, and is not intended to refer to the genus of  
30 these sequences. In other words, it is a shorthand for listing all of these sequences

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individually. The invention encompasses each sequence individually, as well as any combination thereof.

#### Definitions

5 "Nucleic acid" or "polynucleotide" as used herein refers to purine- and pyrimidine-containing polymers of any length, either polyribonucleotides or polydeoxyribonucleotides or mixed polyribo-polydeoxyribo nucleotides. This includes single- and double-stranded molecules, i.e., DNA-DNA, DNA-RNA and RNA-RNA hybrids, as well as "protein nucleic acids" (PNA) formed by conjugating bases to an  
10 amino acid backbone. This also includes nucleic acids containing modified bases.

A nucleic acid or polypeptide sequence that is "derived from" a designated sequence refers to a sequence that corresponds to a region of the designated sequence. For nucleic acid sequences, this encompasses sequences that are homologous or complementary to the sequence, as well as "sequence-conservative variants" and  
15 "function-conservative variants." For polypeptide sequences, this encompasses "function-conservative variants." Sequence-conservative variants are those in which a change of one or more nucleotides in a given codon position results in no alteration in the amino acid encoded at that position. Function-conservative variants are those in which a given amino acid residue in a polypeptide has been changed without altering the overall  
20 conformation and function of the native polypeptide, including, but not limited to, replacement of an amino acid with one having similar physico-chemical properties (such as, for example, acidic, basic, hydrophobic, and the like). "Function-conservative" variants also include any polypeptides that have the ability to elicit antibodies specific to a designated polypeptide.

25 An "S. epidermidis-derived" nucleic acid or polypeptide sequence may or may not be present in other bacterial species, and may or may not be present in all S. epidermidis strains. This term is intended to refer to the source from which the sequence was originally isolated. Thus, a S. epidermidis-derived polypeptide, as used herein, may be used, e.g., as a target to screen for a broad spectrum antibacterial agent, to search for  
30 homologous proteins in other species of bacteria or in eukaryotic organisms such as fungi and humans, etc.

A purified or isolated polypeptide or a substantially pure preparation of a polypeptide are used interchangeably herein and, as used herein, mean a polypeptide that has been separated from other proteins, lipids, and nucleic acids with which it naturally occurs. Preferably, the polypeptide is also separated from substances, e.g., antibodies or gel matrix, e.g., polyacrylamide, which are used to purify it. Preferably, the polypeptide constitutes at least 10, 20, 50 70, 80 or 95% dry weight of the purified preparation. Preferably, the preparation contains: sufficient polypeptide to allow protein sequencing; at least 1, 10, or 100 mg of the polypeptide.

A purified preparation of cells refers to, in the case of plant or animal cells, an in vitro preparation of cells and not an entire intact plant or animal. In the case of cultured cells or microbial cells, it consists of a preparation of at least 10% and more preferably 50% of the subject cells.

A purified or isolated or a substantially pure nucleic acid, e.g., a substantially pure DNA, (are terms used interchangeably herein) is a nucleic acid which is one or both of the following: not immediately contiguous with both of the coding sequences with which it is immediately contiguous (i.e., one at the 5' end and one at the 3' end) in the naturally-occurring genome of the organism from which the nucleic acid is derived; or which is substantially free of a nucleic acid with which it occurs in the organism from which the nucleic acid is derived. The term includes, for example, a recombinant DNA which is incorporated into a vector, e.g., into an autonomously replicating plasmid or virus, or into the genomic DNA of a prokaryote or eukaryote, or which exists as a separate molecule (e.g., a cDNA or a genomic DNA fragment produced by PCR or restriction endonuclease treatment) independent of other DNA sequences. Substantially pure DNA also includes a recombinant DNA which is part of a hybrid gene encoding additional *S. epidermidis* DNA sequence.

A "contig" as used herein is a nucleic acid representing a continuous stretch of genomic sequence of an organism.

An "open reading frame", also referred to herein as ORF, is a region of nucleic acid which encodes a polypeptide. This region may represent a portion of a coding sequence or a total sequence and can be determined from a stop to stop codon or from a start to stop codon.

As used herein, a "coding sequence" is a nucleic acid which is transcribed into messenger RNA and/or translated into a polypeptide when placed under the control of appropriate regulatory sequences. The boundaries of the coding sequence are determined by a translation start codon at the five prime terminus and a translation stop code at the three prime terminus. A coding sequence can include but is not limited to messenger RNA, synthetic DNA, and recombinant nucleic acid sequences.

A "complement" of a nucleic acid as used herein refers to an anti-parallel or antisense sequence that participates in Watson-Crick base-pairing with the original sequence.

A "gene product" is a protein or structural RNA which is specifically encoded by a gene.

As used herein, the term "probe" refers to a nucleic acid, peptide or other chemical entity which specifically binds to a molecule of interest. Probes are often associated with or capable of associating with a label. A label is a chemical moiety capable of detection. Typical labels comprise dyes, radioisotopes, luminescent and chemiluminescent moieties, fluorophores, enzymes, precipitating agents, amplification sequences, and the like. Similarly, a nucleic acid, peptide or other chemical entity which specifically binds to a molecule of interest and immobilizes such molecule is referred herein as a "capture ligand". Capture ligands are typically associated with or capable of associating with a support such as nitro-cellulose, glass, nylon membranes, beads, particles and the like. The specificity of hybridization is dependent on conditions such as the base pair composition of the nucleotides, and the temperature and salt concentration of the reaction. These conditions are readily discernable to one of ordinary skill in the art using routine experimentation.

"Homologous" refers to the sequence similarity or sequence identity between two polypeptides or between two nucleic acid molecules. When a position in both of the two compared sequences is occupied by the same base or amino acid monomer subunit, e.g., if a position in each of two DNA molecules is occupied by adenine, then the molecules are homologous at that position. The percent of homology between two sequences is a function of the number of matching or homologous positions shared by the two sequences divided by the number of positions compared x 100. For example, if 6 of 10



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of the positions in two sequences are matched or homologous then the two sequences are 60% homologous. By way of example, the DNA sequences ATTGCC and TATGGC share 50% homology. Generally, a comparison is made when two sequences are aligned to give maximum homology.

5 Nucleic acids are hybridizable to each other when at least one strand of a nucleic acid can anneal to the other nucleic acid under defined stringency conditions. Stringency of hybridization is determined by: (a) the temperature at which hybridization and/or washing is performed; and (b) the ionic strength and polarity of the hybridization and washing solutions. Hybridization requires that the two nucleic acids contain  
10 complementary sequences; depending on the stringency of hybridization, however, mismatches may be tolerated. Typically, hybridization of two sequences at high stringency (such as, for example, in a solution of 0.5X SSC, at 65° C) requires that the sequences be essentially completely homologous. Conditions of intermediate stringency (such as, for example, 2X SSC at 65 ° C) and low stringency (such as, for example 2X  
15 SSC at 55° C), require correspondingly less overall complementarity between the hybridizing sequences. (1X SSC is 0.15 M NaCl, 0.015 M Na citrate).

The terms peptides, proteins, and polypeptides are used interchangeably herein.

As used herein, the term "surface protein" refers to all surface accessible proteins, e.g. inner and outer membrane proteins, proteins adhering to the cell wall, and secreted  
20 proteins.

A polypeptide has *S. epidermidis* biological activity if it has one, two and preferably more of the following properties: (1) if when expressed in the course of a *S. epidermidis* infection, it can promote, or mediate the attachment of *S. epidermidis* to a cell; (2) it has an enzymatic activity, structural or regulatory function characteristic of a  
25 *S. epidermidis* protein; (3) or the gene which encodes it can rescue a lethal mutation in a *S. epidermidis* gene. A polypeptide has biological activity if it is an antagonist, agonist, or super-agonist of a polypeptide having one of the above-listed properties.

A biologically active fragment or analog is one having an in vivo or in vitro activity which is characteristic of the *S. epidermidis* polypeptides of the invention  
30 contained in the Sequence Listing, or of other naturally occurring *S. epidermidis* polypeptides, e.g., one or more of the biological activities described herein. Especially

preferred are fragments which exist in vivo, e.g., fragments which arise from post transcriptional processing or which arise from translation of alternatively spliced RNA's. Fragments include those expressed in native or endogenous cells as well as those made in expression systems, e.g., in CHO (Chinese Hamster Ovary) cells. Because peptides such as S. epidermidis polypeptides often exhibit a range of physiological properties and because such properties may be attributable to different portions of the molecule, a useful S. epidermidis fragment or S. epidermidis analog is one which exhibits a biological activity in any biological assay for S. epidermidis activity. Most preferably the fragment or analog possesses 10%, preferably 40%, more preferably 60%, 70%, 80% or 90% or greater of the activity of S. epidermidis, in any in vivo or in vitro assay.

          Analogues can differ from naturally occurring S. epidermidis polypeptides in amino acid sequence or in ways that do not involve sequence, or both. Non-sequence modifications include changes in acetylation, methylation, phosphorylation, carboxylation, or glycosylation. Preferred analogues include S. epidermidis polypeptides (or biologically active fragments thereof) whose sequences differ from the wild-type sequence by one or more conservative amino acid substitutions or by one or more non-conservative amino acid substitutions, deletions, or insertions which do not substantially diminish the biological activity of the S. epidermidis polypeptide. Conservative substitutions typically include the substitution of one amino acid for another with similar characteristics, e.g., substitutions within the following groups: valine, glycine; glycine, alanine; valine, isoleucine, leucine; aspartic acid, glutamic acid; asparagine, glutamine; serine, threonine; lysine, arginine; and phenylalanine, tyrosine. Other conservative substitutions can be made in view of the table below.

TABLE 1  
CONSERVATIVE AMINO ACID REPLACEMENTS

For Amino Acid	
Code	
Replace with any of	
Alanine	
A	D-Ala, Gly, beta-Ala, L-Cys, D-Cys

Arginine

R

D-Arg, Lys, D-Lys, homo-Arg, D-homo-Arg, Met, Ile, D-Met, D-Ile, Orn, D-Orn

Asparagine

5 N

D-Asn, Asp, D-Asp, Glu, D-Glu, Gln, D-Gln

Aspartic Acid

D

D-Asp, D-Asn, Asn, Glu, D-Glu, Gln, D-Gln

10 Cysteine

C

D-Cys, S-Me-Cys, Met, D-Met, Thr, D-Thr

Glutamine

Q

15 D-Gln, Asn, D-Asn, Glu, D-Glu, Asp, D-Asp

Glutamic Acid

E

D-Glu, D-Asp, Asp, Asn, D-Asn, Gln, D-Gln

Glycine

20 G

Ala, D-Ala, Pro, D-Pro,

(-Ala, Acp

Isoleucine

I

25 D-Ile, Val, D-Val, Leu, D-Leu, Met, D-Met

Leucine

L

D-Leu, Val, D-Val, Leu, D-Leu, Met, D-Met

Lysine

30 K

D-Lys, Arg, D-Arg, homo-Arg, D-homo-Arg, Met, D-Met, Ile, D-Ile, Orn, D-Orn

Methionine

M

D-Met, S-Me-Cys, Ile, D-Ile, Leu, D-Leu, Val, D-Val

Phenylalanine

5 F

D-Phe, Tyr, D-Thr, L-Dopa, His, D-His, Trp, D-Trp, Trans-3,4, or 5-phenylproline, cis-3,4, or 5-phenylproline

Proline

P

10 D-Pro, L-I-thioazolidine-4-carboxylic acid, D-or L-1-oxazolidine-4-carboxylic acid

Serine

S

D-Ser, Thr, D-Thr, allo-Thr, Met, D-Met, Met(O),

15 D-Met(O), L-Cys, D-Cys

Threonine

T

D-Thr, Ser, D-Ser, allo-Thr, Met, D-Met, Met(O),

D-Met(O), Val, D-Val

20 Tyrosine

Y

D-Tyr, Phe, D-Phe, L-Dopa, His, D-His

Valine

V

25 D-Val, Leu, D-Leu, Ile, D-Ile, Met, D-Met

Other analogs within the invention are those with modifications which increase peptide stability; such analogs may contain, for example, one or more non-peptide bonds (which replace the peptide bonds) in the peptide sequence. Also included are: analogs  
30 that include residues other than naturally occurring L-amino acids, e.g., D-amino acids or

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non-naturally occurring or synthetic amino acids, e.g., ( or ( amino acids; and cyclic analogs.

As used herein, the term "fragment", as applied to a *S. epidermidis* analog, will ordinarily be at least about 20 residues, more typically at least about 40 residues,  
5 preferably at least about 60 residues in length. Fragments of *S. epidermidis* polypeptides can be generated by methods known to those skilled in the art. The ability of a *Staphylococcus* fragment to exhibit a biological activity of *S. epidermidis* polypeptide can be assessed by methods known to those skilled in the art as described herein. Also included are *S. epidermidis* polypeptides containing residues that are not required for  
10 biological activity of the peptide or that result from alternative mRNA splicing or alternative protein processing events.

An "immunogenic component" as used herein is a moiety, such as a *S. epidermidis* polypeptide, analog or fragment thereof, that is capable of eliciting a humoral and/or cellular immune response in a host animal.

15 An "antigenic component" as used herein is a moiety, such as a *S. epidermidis* polypeptide, analog or fragment thereof, that is capable of binding to a specific antibody with sufficiently high affinity to form a detectable antigen-antibody complex.

The term "antibody" as used herein is intended to include fragments thereof which are specifically reactive with *S. epidermidis* polypeptides.

20 As used herein, the term "cell-specific promoter" means a DNA sequence that serves as a promoter, i.e., regulates expression of a selected DNA sequence operably linked to the promoter, and which effects expression of the selected DNA sequence in specific cells of a tissue. The term also covers so-called "leaky" promoters, which regulate expression of a selected DNA primarily in one tissue, but cause expression in  
25 other tissues as well.

Misexpression, as used herein, refers to a non-wild type pattern of gene expression. It includes: expression at non-wild type levels, i.e., over or under expression; a pattern of expression that differs from wild type in terms of the time or stage at which the gene is expressed, e.g., increased or decreased expression (as compared with wild  
30 type) at a predetermined developmental period or stage; a pattern of expression that differs from wild type in terms of increased expression (as compared with wild type) in a

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predetermined cell type or tissue type; a pattern of expression that differs from wild type in terms of the splicing size, amino acid sequence, post-translational modification, or biological activity of the expressed polypeptide; a pattern of expression that differs from wild type in terms of the effect of an environmental stimulus or extracellular stimulus on expression of the gene, e.g., a pattern of increased or decreased expression (as compared with wild type) in the presence of an increase or decrease in the strength of the stimulus.

As used herein, "host cells" and other such terms denoting microorganisms or higher eukaryotic cell lines cultured as unicellular entities refers to cells which can become or have been used as recipients for a recombinant vector or other transfer DNA, and include the progeny of the original cell which has been transfected. It is understood by individuals skilled in the art that the progeny of a single parental cell may not necessarily be completely identical in genomic or total DNA compliment to the original parent, due to accident or deliberate mutation.

As used herein, the term "control sequence" refers to a nucleic acid having a base sequence which is recognized by the host organism to effect the expression of encoded sequences to which they are ligated. The nature of such control sequences differs depending upon the host organism; in prokaryotes, such control sequences generally include a promoter, ribosomal binding site, terminators, and in some cases operators; in eukaryotes, generally such control sequences include promoters, terminators and in some instances, enhancers. The term control sequence is intended to include at a minimum, all components whose presence is necessary for expression, and may also include additional components whose presence is advantageous, for example, leader sequences.

As used herein, the term "operably linked" refers to sequences joined or ligated to function in their intended manner. For example, a control sequence is operably linked to coding sequence by ligation in such a way that expression of the coding sequence is achieved under conditions compatible with the control sequence and host cell.

The "metabolism" of a substance, as used herein, means any aspect of the expression, function, action, or regulation of the substance. The metabolism of a substance includes modifications, e.g., covalent or non-covalent modifications of the substance. The metabolism of a substance includes modifications, e.g., covalent or non-covalent modification, the substance induces in other substances. The metabolism of a

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substance also includes changes in the distribution of the substance. The metabolism of a substance includes changes the substance induces in the distribution of other substances.

A "sample" as used herein refers to a biological sample, such as, for example, tissue or fluid isolated from an individual (including without limitation plasma, serum, cerebrospinal fluid, lymph, tears, saliva and tissue sections) or from in vitro cell culture constituents, as well as samples from the environment.

Technical and scientific terms used herein have the meanings commonly understood by one of ordinary skill in the art to which the present invention pertains, unless otherwise defined. Reference is made herein to various methodologies known to those of skill in the art. Publications and other materials setting forth such known methodologies to which reference is made are incorporated herein by reference in their entireties as though set forth in full. The practice of the invention will employ, unless otherwise indicated, conventional techniques of chemistry, molecular biology, microbiology, recombinant DNA, and immunology, which are within the skill of the art. Such techniques are explained fully in the literature. See e.g., Sambrook, Fritsch, and Maniatis, Molecular Cloning; Laboratory Manual 2nd ed. (1989); DNA Cloning, Volumes I and II (D.N Glover ed. 1985); Oligonucleotide Synthesis (M.J. Gait ed, 1984); Nucleic Acid Hybridization (B.D. Hames & S.J. Higgins eds. 1984); the series, Methods in Enzymology (Academic Press, Inc.), particularly Vol. 154 and Vol. 155 (Wu and Grossman, eds.); PCR-A Practical Approach (McPherson, Quirke, and Taylor, eds., 1991); Immunology, 2d Edition, 1989, Roitt et al., C.V. Mosby Company, and New York; Advanced Immunology, 2d Edition, 1991, Male et al., Grower Medical Publishing, New York.; DNA Cloning: A Practical Approach, Volumes I and II, 1985 (D.N. Glover ed.); Oligonucleotide Synthesis, 1984, (M.L. Gait ed); Transcription and Translation, 1984 (Hames and Higgins eds.); Animal Cell Culture, 1986 (R.I. Freshney ed.); Immobilized Cells and Enzymes, 1986 (IRL Press); Perbal, 1984, A Practical Guide to Molecular Cloning; and Gene Transfer Vectors for Mammalian Cells, 1987 (J. H. Miller and M. P. Calos eds., Cold Spring Harbor Laboratory);

Any suitable materials and/or methods known to those of skill can be utilized in carrying out the present invention: however preferred materials and/or methods are described. Materials, reagents and the like to which reference is made in the following

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description and examples are obtainable from commercial sources, unless otherwise noted.

#### *S. epidermidis* Genomic Sequence

5           This invention provides nucleotide sequences of the genome of *S. epidermidis* which thus comprises a DNA sequence library of *S. epidermidis* genomic DNA. The detailed description that follows provides nucleotide sequences of *S. epidermidis*, and also describes how the sequences were obtained and how ORFs and protein-coding sequences were identified. Also described are methods of using the disclosed *S.*  
10 *epidermidis* sequences in methods including diagnostic and therapeutic applications. Furthermore, the library can be used as a database for identification and comparison of medically important sequences in this and other strains of *S. epidermidis*.

To determine the genomic sequence of *S. epidermidis*, DNA from strain 18972 of *S. epidermidis* was isolated after Zymolyase digestion, sodium dodecyl sulfate lysis,  
15 potassium acetate precipitation, phenol:chloroform extraction and ethanol precipitation (Soll, D.R., T. Srikantha and S.R. Lockhart: Characterizing Developmentally Regulated Genes in *S. epidermidis*. In *Microbial Genome Methods*. K.W. Adolph, editor. CRC Press. New York. p 17-37.). DNA was sheared hydrodynamically using an HPLC (Oefner, et. al., 1996) to an insert size of 2000-3000 bp. After size fractionation by gel  
20 electrophoresis the fragments were blunt-ended, ligated to adapter oligonucleotides and cloned into the pGTC (Thomann) vector to construct a "shotgun" subclone library

DNA sequencing was achieved using established ABI sequencing methods on ABI377 automated DNA sequencers. The cloning and sequencing procedures are described in more detail in the Exemplification.

25           Individual sequence reads were assembled using PHRAP (P. Green, Abstracts of DOE Human Genome Program Contractor-Grantee Workshop V, Jan. 1996, p.157). The average contig length was about 3-4 kb.

All subsequent steps were based on sequencing by ABI377 automated DNA sequencing methods. The cloning and sequencing procedures are described in more  
30 detail in the Exemplification.



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A variety of approaches are used to order the contigs so as to obtain a continuous sequence representing the entire *S. epidermidis* genome. Synthetic oligonucleotides are designed that are complementary to sequences at the end of each contig. These oligonucleotides may be hybridized to libraries of *S. epidermidis* genomic DNA in, for example, lambda phage vectors or plasmid vectors to identify clones that contain sequences corresponding to the junctional regions between individual contigs. Such clones are then used to isolate template DNA and the same oligonucleotides are used as primers in polymerase chain reaction (PCR) to amplify junctional fragments, the nucleotide sequence of which is then determined.

The *S. epidermidis* sequences were analyzed for the presence of open reading frames (ORFs) comprising at least 180 nucleotides. As a result of the analysis of ORFs based on stop-to-stop codon reads, it should be understood that these ORFs may not correspond to the ORF of a naturally-occurring *S. epidermidis* polypeptide. These ORFs may contain start codons which indicate the initiation of protein synthesis of a naturally-occurring *S. epidermidis* polypeptide. Such start codons within the ORFs provided herein were identified by those of ordinary skill in the relevant art, and the resulting ORF and the encoded *S. epidermidis* polypeptide is within the scope of this invention. For example, within the ORFs a codon such as AUG or GUG (encoding methionine or valine) which is part of the initiation signal for protein synthesis were identified and the portion of an ORF to corresponding to a naturally-occurring *S. epidermidis* polypeptide was recognized. The predicted coding regions were defined by evaluating the coding potential of such sequences with the program GENEMARK" (Borodovsky and McIninch, 1993, Comp. . 17:123).

Each predicted ORF amino acid sequence was compared with all sequences found in current GENBANK, SWISS-PROT, and PIR databases using the BLAST algorithm. BLAST identifies local alignments occurring by chance between the ORF sequence and the sequence in the databank (Altschall et al., 1990, L Mol. Biol. 215:403-410). Homologous ORFs (probabilities less than  $10^{-5}$  by chance) and ORF's that are probably non-homologous (probabilities greater than  $10^{-5}$  by chance) but have good codon usage were identified. Both homologous, sequences and non-homologous

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sequences with good codon usage, are likely to encode proteins and are encompassed by the invention.

#### *S. epidermidis* Nucleic Acids

5           The present invention provides a library of *S. epidermidis* -derived nucleic acid sequences. The libraries provide probes, primers, and markers which are used as markers in epidemiological studies. The present invention also provides a library of *S. epidermidis* -derived nucleic acid sequences which comprise or encode targets for therapeutic drugs.

          The nucleic acids of this invention may be obtained directly from the DNA of the  
10   above referenced *S. epidermidis* strain by using the polymerase chain reaction (PCR). See "PCR, A Practical Approach" (McPherson, Quirke, and Taylor, eds., IRL Press, Oxford, UK, 1991) for details about the PCR. High fidelity PCR is used to ensure a faithful DNA copy prior to expression. In addition, the authenticity of amplified products is verified by  
15   conventional sequencing methods. Clones carrying the desired sequences described in this invention may also be obtained by screening the libraries by means of the PCR or by hybridization of synthetic oligonucleotide probes to filter lifts of the library colonies or plaques as known in the art (see, e.g., Sambrook et al., Molecular Cloning, A Laboratory Manual 2nd edition, 1989, Cold Spring Harbor Press, NY).

          It is also possible to obtain nucleic acids encoding *S. epidermidis* polypeptides  
20   from a cDNA library in accordance with protocols herein described. A cDNA encoding a *S. epidermidis* polypeptide can be obtained by isolating total mRNA from an appropriate strain. Double stranded cDNAs can then be prepared from the total mRNA. Subsequently, the cDNAs can be inserted into a suitable plasmid or viral (e.g., bacteriophage) vector using any one of a number of known techniques. Genes encoding  
25   *S. epidermidis* polypeptides can also be cloned using established polymerase chain reaction techniques in accordance with the nucleotide sequence information provided by the invention. The nucleic acids of the invention can be DNA or RNA. Preferred nucleic acids of the invention are contained in the Sequence Listing.

          The nucleic acids of the invention can also be chemically synthesized using  
30   standard techniques. Various methods of chemically synthesizing polydeoxynucleotides are known, including solid-phase synthesis which, like peptide synthesis, has been fully

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automated in commercially available DNA synthesizers (See e.g., Itakura et al. U.S. Patent No. 4,598,049; Caruthers et al. U.S. Patent No. 4,458,066; and Itakura U.S. Patent Nos. 4,401,796 and 4,373,071, incorporated by reference herein).

5 In another example, DNA can be chemically synthesized using, e.g., the phosphoramidite solid support method of Matteucci et al., 1981, J. Am. Chem. Soc. 103:3185, the method of Yoo et al., 1989, J. Biol. Chem. 264:17078, or other well known methods. This can be done by sequentially linking a series of oligonucleotide cassettes comprising pairs of synthetic oligonucleotides, as described below.

10 Nucleic acids isolated or synthesized in accordance with features of the present invention are useful, by way of example, without limitation, as probes, primers, capture ligands, antisense genes and for developing expression systems for the synthesis of proteins and peptides corresponding to such sequences. As probes, primers, capture ligands and antisense agents, the nucleic acid normally consists of all or part (approximately twenty or more nucleotides for specificity as well as the ability to form  
15 stable hybridization products) of the nucleic acids of the invention contained in the Sequence Listing. These uses are described in further detail below.

#### Probes

A nucleic acid isolated or synthesized in accordance with the sequence of the invention contained in the Sequence Listing can be used as a probe to specifically detect  
20 *S. epidermidis*. With the sequence information set forth in the present application, sequences of twenty or more nucleotides are identified which provide the desired inclusivity and exclusivity with respect to *S. epidermidis*, and extraneous nucleic acids likely to be encountered during hybridization conditions. More preferably, the sequence will comprise at least twenty to thirty nucleotides to convey stability to the hybridization  
25 product formed between the probe and the intended target molecules.

Sequences larger than 1000 nucleotides in length are difficult to synthesize but can be generated by recombinant DNA techniques. Individuals skilled in the art will readily recognize that the nucleic acids, for use as probes, can be provided with a label to facilitate detection of a hybridization product.

30 Nucleic acid isolated and synthesized in accordance with the sequence of the invention contained in the Sequence Listing can also be useful as probes to detect

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homologous regions (especially homologous genes) of other *Staphylococcus* species using appropriate stringency hybridization conditions as described herein.

#### Capture Ligand

For use as a capture ligand, the nucleic acid selected in the manner described above with respect to probes, can be readily associated with a support. The manner in which nucleic acid is associated with supports is well known. Nucleic acid having twenty or more nucleotides in a sequence of the invention contained in the Sequence Listing have utility to separate *S. epidermidis* nucleic acid from one strain from the nucleic acid of other another strain as well as from other organisms. Nucleic acid having twenty or more nucleotides in a sequence of the invention contained in the Sequence Listing can also have utility to separate other *Staphylococcus* species from each other and from other organisms. Preferably, the sequence will comprise at least twenty nucleotides to convey stability to the hybridization product formed between the probe and the intended target molecules. Sequences larger than 1000 nucleotides in length are difficult to synthesize but can be generated by recombinant DNA techniques.

#### Primers

Nucleic acid isolated or synthesized in accordance with the sequences described herein have utility as primers for the amplification of *S. epidermidis* nucleic acid. These nucleic acids may also have utility as primers for the amplification of nucleic acids in other *Staphylococcus* species. With respect to polymerase chain reaction (PCR) techniques, nucleic acid sequences of > 10-15 nucleotides of the invention contained in the Sequence Listing have utility in conjunction with suitable enzymes and reagents to create copies of *S. epidermidis* nucleic acid. More preferably, the sequence will comprise twenty or more nucleotides to convey stability to the hybridization product formed between the primer and the intended target molecules. Binding conditions of primers greater than 100 nucleotides are more difficult to control to obtain specificity. High fidelity PCR can be used to ensure a faithful DNA copy prior to expression. In addition, amplified products can be checked by conventional sequencing methods.

The copies can be used in diagnostic assays to detect specific sequences, including genes from *S. epidermidis* and/or other *Staphylococcus* species. The copies can also be incorporated into cloning and expression vectors to generate polypeptides

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corresponding to the nucleic acid synthesized by PCR, as is described in greater detail herein.

The nucleic acids of the present invention find use as templates for the recombinant production of *S. epidermidis*-derived peptides or polypeptides

5           Antisense

Nucleic acid or nucleic acid-hybridizing derivatives isolated or synthesized in accordance with the sequences described herein have utility as antisense agents to prevent the expression of *S. epidermidis* genes. These sequences also have utility as antisense agents to prevent expression of genes of other *Staphylococcus* species.

10           In one embodiment, nucleic acid or derivatives corresponding to *S. epidermidis* nucleic acids is loaded into a suitable carrier such as a liposome or bacteriophage for introduction into bacterial cells. For example, a nucleic acid having twenty or more nucleotides is capable of binding to bacteria nucleic acid or bacteria messenger RNA. Preferably, the antisense nucleic acid is comprised of 20 or more nucleotides to provide  
15           necessary stability of a hybridization product of non-naturally occurring nucleic acid and bacterial nucleic acid and/or bacterial messenger RNA. Nucleic acid having a sequence greater than 1000 nucleotides in length is difficult to synthesize but can be generated by recombinant DNA techniques. Methods for loading antisense nucleic acid in liposomes is known in the art as exemplified by U.S. Patent 4,241,046 issued December 23, 1980 to  
20           Papahadjopoulos et al.

The present invention encompasses isolated polypeptides and nucleic acids derived from *S. epidermidis* that are useful as reagents for diagnosis of bacterial infection, components of effective anti-bacterial vaccines, and/or as targets for anti-bacterial drugs, including anti-*S. epidermidis* drugs.

25

Expression of *S. epidermidis* Nucleic Acids

Table 2, which is appended herewith and which forms part of the present specification, provides a list of open reading frames (ORFs) in both strands and a putative identification of the particular function of a polypeptide which is encoded by each ORF,  
30           based on the homology match (determined by the BLAST algorithm) of the predicted polypeptide with known proteins encoded by ORFs in other organisms.. An ORF is a

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region of nucleic acid which encodes a polypeptide. This region may represent a portion of a coding sequence or a total sequence and was determined from stop to stop codons. The first column contains a designation for the contig from which each ORF was identified (numbered arbitrarily). Each contig represents a continuous stretch of the

5 genomic sequence of the organism. The second column lists the ORF designation. The third and fourth columns list the SEQ ID numbers for the nucleic acid and amino acid sequences corresponding to each ORF, respectively. The fifth and sixth columns list the length of the nucleic acid and the length of the amino acid, respectively. The nucleotide sequence corresponding to each ORF designation begins at the first nucleotide

10 immediately following a stop codon and ends at the nucleotide immediately preceding the next downstream stop codon in the same reading frame. It will be recognized by one skilled in the art that the natural translation initiation sites will correspond to ATG, GTG, or TTG codons located within the ORFs. The natural initiation sites depend not only on the sequence of a start codon but also on the context of the DNA sequence adjacent to the

15 start codon. Usually, a recognizable ribosome binding site is found within 20 nucleotides upstream from the initiation codon. In some cases where genes are translationally coupled and coordinately expressed together in "operons", ribosome binding sites are not present, but the initiation codon of a downstream gene may occur very close to, or overlap, the stop codon of the an upstream gene in the same operon. The correct start

20 codons can be generally identified without undue experimentation because only a few codons need be tested. It is recognized that the translational machinery in bacteria initiates all polypeptide chains with the amino acid methionine, regardless of the sequence of the start codon. In some cases, polypeptides are post-translationally modified, resulting in an N-terminal amino acid other than methionine in vivo. The

25 seventh and eighth columns provide metrics for assessing the likelihood of the homology match (determined by the BLASTP2 algorithm), as is known in the art, to the genes indicated in the eleventh column when the designated ORF was compared against a non-redundant comprehensive protein database. Specifically, the seventh column represents the "Blast Score" for the match (a higher score is a better match), and the eighth column

30 represents the "P-value" for the match (the probability that such a match can have occurred by chance; the lower the value, the more likely the match is valid). If a

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BLASTP2 score of less than 46 was obtained, no value is reported in the table the "P-value". Column nine, Subject Taxonomy," provides the name of the organism that was identified as having the closest homology match. The tenth column,"Subject Name," provides where available, either a public database accession number or our own sequence name. The eleventh column provides, where available, the Swissprot accession number (SP), the locus name (LN), the Organism (OR), Source of variant (SR), E.C. number (EC),the gene name (GN), the product name (PN), the Function Description (FN), Left End (LE), Right End (RE), Coding Direction (DI), and the description (DE) or notes (NT) for each ORF. Information that is not preceded by a code designation in the eleventh column represents a description of the ORF. This information allows one of ordinary skill in the art to determine a potential use for each identified coding sequence and, as a result, allows use of the polypeptides of the present invention for commercial and industrial purposes .

Using the information provided in SEQ ID NO: 1 - SEQ ID NO: 2837 and in Table 2 together with routine cloning and sequencing methods, one of ordinary skill in the art will be able to clone and sequence all the nucleic acid fragments of interest including open reading frames (ORFs) encoding a large variety proteins of *S. epidermidis*.

Nucleic acid isolated or synthesized in accordance with the sequences described herein have utility to generate polypeptides. The nucleic acid of the invention exemplified in SEQ ID NO: 1 - SEQ ID NO: 2837 and in Table 2 or fragments of said nucleic acid encoding active portions of *S. epidermidis* polypeptides can be cloned into suitable vectors or used to isolate nucleic acid. The isolated nucleic acid is combined with suitable DNA linkers and cloned into a suitable vector.

The function of a specific gene or operon can be ascertained by expression in a bacterial strain under conditions where the activity of the gene product(s) specified by the gene or operon in question can be specifically measured. Alternatively, a gene product may be produced in large quantities in an expressing strain for use as an antigen, an industrial reagent, for structural studies, etc. This expression can be accomplished in a mutant strain which lacks the activity of the gene to be tested, or in a strain that does not produce the same gene product(s). This includes, but is not limited to, Eucaryotic species

such as the yeast *Saccharomyces cerevisiae*, *Methanobacterium* strains or other Archaea, and Eubacteria such as *E. coli*, *B. Subtilis*, *S. Aureus*, *S. Pneumonia* or *Pseudomonas putida*. In some cases the expression host will utilize the natural *S. epidermidis* promoter whereas in others, it will be necessary to drive the gene with a promoter sequence derived from the expressing organism (e.g., an *E. coli* beta-galactosidase promoter for expression in *E. coli*).

To express a gene product using the natural *S. epidermidis* promoter, a procedure such as the following can be used. A restriction fragment containing the gene of interest, together with its associated natural promoter element and regulatory sequences (identified using the DNA sequence data) is cloned into an appropriate recombinant plasmid containing an origin of replication that functions in the host organism and an appropriate selectable marker. This can be accomplished by a number of procedures known to those skilled in the art. It is most preferably done by cutting the plasmid and the fragment to be cloned with the same restriction enzyme to produce compatible ends that can be ligated to join the two pieces together. The recombinant plasmid is introduced into the host organism by, for example, electroporation and cells containing the recombinant plasmid are identified by selection for the marker on the plasmid. Expression of the desired gene product is detected using an assay specific for that gene product.

In the case of a gene that requires a different promoter, the body of the gene (coding sequence) is specifically excised and cloned into an appropriate expression plasmid. This subcloning can be done by several methods, but is most easily accomplished by PCR amplification of a specific fragment and ligation into an expression plasmid after treating the PCR product with a restriction enzyme or exonuclease to create suitable ends for cloning.

A suitable host cell for expression of a gene can be any procaryotic or eucaryotic cell. Suitable methods for transforming host cells can be found in Sambrook et al. (Molecular Cloning: A Laboratory Manual, 2nd Edition, Cold Spring Harbor Laboratory press (1989)), and other laboratory textbooks.

For example, a host cell transfected with a nucleic acid vector directing expression of a nucleotide sequence encoding a *S. epidermidis* polypeptide can be cultured under appropriate conditions to allow expression of the polypeptide to occur.



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Suitable media for cell culture are well known in the art. Polypeptides of the invention can be isolated from cell culture medium, host cells, or both using techniques known in the art for purifying proteins including ion-exchange chromatography, gel filtration chromatography, ultrafiltration, electrophoresis, and immunoaffinity purification with  
5 antibodies specific for such polypeptides. Additionally, in many situations, polypeptides can be produced by chemical cleavage of a native protein (e.g., tryptic digestion) and the cleavage products can then be purified by standard techniques.

In the case of membrane bound proteins, these can be isolated from a host cell by contacting a membrane-associated protein fraction with a detergent forming a solubilized  
10 complex, where the membrane-associated protein is no longer entirely embedded in the membrane fraction and is solubilized at least to an extent which allows it to be chromatographically isolated from the membrane fraction. Chromatographic techniques which can be used in the final purification step are known in the art and include hydrophobic interaction, lectin affinity, ion exchange, dye affinity and immunoaffinity.

15 One strategy to maximize recombinant *S. epidermidis* peptide expression in *E. coli* is to express the protein in a host bacteria with an impaired capacity to proteolytically cleave the recombinant protein (Gottesman, S., *Gene Expression Technology: Methods in Enzymology* 185, Academic Press, San Diego, California (1990) 119-128). Another strategy would be to alter the nucleic acid encoding a *S.*  
20 *epidermidis* peptide to be inserted into an expression vector so that the individual codons for each amino acid would be those preferentially utilized in highly expressed *E. coli* proteins (Wada et al., (1992) *Nuc. Acids Res.* 20:2111-2118). Such alteration of nucleic acids of the invention can be carried out by standard DNA synthesis techniques.

The nucleic acids of the invention can also be chemically synthesized using  
25 standard techniques. Various methods of chemically synthesizing polydeoxynucleotides are known, including solid-phase synthesis which, like peptide synthesis, has been fully automated in commercially available DNA synthesizers (See, e.g., Itakura et al. U.S. Patent No. 4,598,049; Caruthers et al. U.S. Patent No. 4,458,066; and Itakura U.S. Patent Nos. 4,401,796 and 4,373,071, incorporated by reference herein).

30 The present invention provides a library of *S. epidermidis*-derived nucleic acid sequences. The libraries provide probes, primers, and markers which can be used as

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markers in epidemiological studies. The present invention also provides a library of S. epidermidis-derived nucleic acid sequences which comprise or encode targets for therapeutic drugs.

Nucleic acids comprising any of the sequences disclosed herein or sub-sequences thereof can be prepared by standard methods using the nucleic acid sequence information provided in SEQ ID NO: 1 - SEQ ID NO: 2837. For example, DNA can be chemically synthesized using, e.g., the phosphoramidite solid support method of Matteucci et al., 1981, J. Am. Chem. Soc. 103:3185, the method of Yoo et al., 1989, J. Biol. Chem. 264:17078, or other well known methods. This can be done by sequentially linking a series of oligonucleotide cassettes comprising pairs of synthetic oligonucleotides, as described below.

Of course, due to the degeneracy of the genetic code, many different nucleotide sequences can encode polypeptides having the amino acid sequences defined by SEQ ID NO: 2838 - SEQ ID NO: 5674 or sub-sequences thereof. The codons can be selected for optimal expression in prokaryotic or eukaryotic systems. Such degenerate variants are also encompassed by this invention.

Insertion of nucleic acids (typically DNAs) encoding the polypeptides of the invention into a vector is easily accomplished when the termini of both the DNAs and the vector comprise compatible restriction sites. If this cannot be done, it may be necessary to modify the termini of the DNAs and/or vector by digesting back single-stranded DNA overhangs generated by restriction endonuclease cleavage to produce blunt ends, or to achieve the same result by filling in the single-stranded termini with an appropriate DNA polymerase.

Alternatively, any site desired may be produced, e.g., by ligating nucleotide sequences (linkers) onto the termini. Such linkers may comprise specific oligonucleotide sequences that define desired restriction sites. Restriction sites can also be generated by the use of the polymerase chain reaction (PCR). See, e.g., Saiki et al., 1988, Science 239:48. The cleaved vector and the DNA fragments may also be modified if required by homopolymeric tailing.

The nucleic acids of the invention may be isolated directly from cells. Alternatively, the polymerase chain reaction (PCR) method can be used to produce the

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nucleic acids of the invention, using either chemically synthesized strands or genomic material as templates. Primers used for PCR can be synthesized using the sequence information provided herein and can further be designed to introduce appropriate new restriction sites, if desirable, to facilitate incorporation into a given vector for

5 recombinant expression.

The nucleic acids of the present invention may be flanked by natural *S. epidermidis* regulatory sequences, or may be associated with heterologous sequences, including promoters, enhancers, response elements, signal sequences, polyadenylation sequences, introns, 5'- and 3'- noncoding regions, and the like. The nucleic acids may also be modified by many means known in the art. Non-limiting examples of such modifications include methylation, "caps", substitution of one or more of the naturally occurring nucleotides with an analog, internucleotide modifications such as, for example, those with uncharged linkages (e.g., methyl phosphonates, phosphotriesters, phosphoroamidates, carbamates, etc.) and with charged linkages (e.g., phosphorothioates, phosphorodithioates, etc.). Nucleic acids may contain one or more additionally linked moieties, such as, for example, proteins (e.g., nucleases, toxins, antibodies, signal peptides, poly-L-lysine, etc.), intercalators (e.g., acridine, psoralen, etc.), chelators (e.g., metals, radioactive metals, iron, oxidative metals, etc.), and alkylators. PNAs are also included. The nucleic acid may be derivatized by formation of a methyl or ethyl phosphotriester or an alkyl phosphoramidate linkage. Furthermore, the nucleic acid sequences of the present invention may also be modified with a label capable of providing a detectable signal, either directly or indirectly. Exemplary labels include radioisotopes, fluorescent molecules, biotin, and the like.

The invention also provides nucleic acid vectors comprising the disclosed *S. epidermidis*-derived sequences or derivatives or fragments thereof. A large number of vectors, including plasmid and bacterial vectors, have been described for replication and/or expression in a variety of eukaryotic and prokaryotic hosts, and may be used for cloning or protein expression.

The encoded *S. epidermidis* polypeptides may be expressed by using many known vectors, such as pUC plasmids, pET plasmids (Novagen, Inc., Madison, WI), or pRSET or pREP (Invitrogen, San Diego, CA), and many appropriate host cells, using methods

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disclosed or cited herein or otherwise known to those skilled in the relevant art. The particular choice of vector/host is not critical to the practice of the invention.

Recombinant cloning vectors will often include one or more replication systems for cloning or expression, one or more markers for selection in the host, e.g. antibiotic resistance, and one or more expression cassettes. The inserted *S. epidermidis* coding sequences may be synthesized by standard methods, isolated from natural sources, or prepared as hybrids, etc. Ligation of the *S. epidermidis* coding sequences to transcriptional regulatory elements and/or to other amino acid coding sequences may be achieved by known methods. Suitable host cells may be transformed/transfected/infected as appropriate by any suitable method including electroporation, CaCl<sub>2</sub> mediated DNA uptake, bacterial infection, microinjection, microprojectile, or other established methods.

Appropriate host cells include bacteria, archebacteria, fungi, especially yeast, and plant and animal cells, especially mammalian cells. Of particular interest are *S. epidermidis*, *E. coli*, *B. Subtilis*, *Saccharomyces cerevisiae*, *Saccharomyces carlsbergensis*, *Schizosaccharomyces pombe*, SF9 cells, C129 cells, 293 cells, *Neurospora*, and CHO cells, COS cells, HeLa cells, and immortalized mammalian myeloid and lymphoid cell lines. Preferred replication systems include M13, ColE1, SV40, baculovirus, lambda, adenovirus, and the like. A large number of transcription initiation and termination regulatory regions have been isolated and shown to be effective in the transcription and translation of heterologous proteins in the various hosts. Examples of these regions, methods of isolation, manner of manipulation, etc. are known in the art. Under appropriate expression conditions, host cells can be used as a source of recombinantly produced *S. epidermidis*-derived peptides and polypeptides.

Advantageously, vectors may also include a transcription regulatory element (i.e., a promoter) operably linked to the *S. epidermidis* portion. The promoter may optionally contain operator portions and/or ribosome binding sites. Non-limiting examples of bacterial promoters compatible with *E. coli* include: b-lactamase (penicillinase) promoter; lactose promoter; tryptophan (trp) promoter; araBAD (arabinose) operon promoter; lambda-derived P<sub>L</sub> promoter and N gene ribosome binding site; and the hybrid tac promoter derived from sequences of the trp and lac UV5 promoters. Non-limiting examples of yeast promoters include 3-phosphoglycerate kinase promoter,

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glyceraldehyde-3-phosphate dehydrogenase (GAPDH) promoter, galactokinase (GAL1) promoter, galactosepimerase promoter, and alcohol dehydrogenase (ADH) promoter.

Suitable promoters for mammalian cells include without limitation viral promoters such as that from Simian Virus 40 (SV40), Rous sarcoma virus (RSV), adenovirus (ADV), and  
5 bovine papilloma virus (BPV). Mammalian cells may also require terminator sequences, polyA addition sequences and enhancer sequences to increase expression. Sequences which cause amplification of the gene may also be desirable. Furthermore, sequences that facilitate secretion of the recombinant product from cells, including, but not limited to, bacteria, yeast, and animal cells, such as secretory signal sequences and/or  
10 prohormone pro region sequences, may also be included. These sequences are well described in the art.

Nucleic acids encoding wild-type or variant *S. epidermidis*-derived polypeptides may also be introduced into cells by recombination events. For example, such a sequence can be introduced into a cell, and thereby effect homologous recombination at the site of  
15 an endogenous gene or a sequence with substantial identity to the gene. Other recombination-based methods such as nonhomologous recombinations or deletion of endogenous genes by homologous recombination may also be used.

The nucleic acids of the present invention find use as templates for the recombinant production of *S. epidermidis*-derived peptides or polypeptides.

20

#### Identification and Use of *S. epidermidis* Nucleic Acid Sequences

The disclosed *S. epidermidis* polypeptide and nucleic acid sequences, or other sequences that are contained within ORFs, including complete protein-coding sequences, of which any of the disclosed *S. epidermidis*-specific sequences forms a part, are useful  
25 as target components for diagnosis and/or treatment of *S. epidermidis*-caused infection

It will be understood that the sequence of an entire protein-coding sequence of which each disclosed nucleic acid sequence forms a part can be isolated and identified based on each disclosed sequence. This can be achieved, for example, by using an isolated nucleic acid encoding the disclosed sequence, or fragments thereof, to prime a  
30 sequencing reaction with genomic *S. epidermidis* DNA as template; this is followed by sequencing the amplified product. The isolated nucleic acid encoding the disclosed

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sequence, or fragments thereof, can also be hybridized to *S. epidermidis* genomic libraries to identify clones containing additional complete segments of the protein-coding sequence of which the shorter sequence forms a part. Then, the entire protein-coding sequence, or fragments thereof, or nucleic acids encoding all or part of the sequence, or  
5 sequence-conservative or function-conservative variants thereof, may be employed in practicing the present invention.

Preferred sequences are those that are useful in diagnostic and/or therapeutic applications. Diagnostic applications include without limitation nucleic-acid-based and antibody-based methods for detecting bacterial infection. Therapeutic applications  
10 include without limitation vaccines, passive immunotherapy, and drug treatments directed against gene products that are both unique to bacteria and essential for growth and/or replication of bacteria.

#### 15 Identification of Nucleic Acids Encoding Vaccine Components and Targets for Agents Effective Against *S. epidermidis*

The disclosed *S. epidermidis* genome sequence includes segments that direct the synthesis of ribonucleic acids and polypeptides, as well as origins of replication, promoters, other types of regulatory sequences, and intergenic nucleic acids. The invention encompasses nucleic acids encoding immunogenic components of vaccines and  
20 targets for agents effective against *S. epidermidis*. Identification of said immunogenic components involved in the determination of the function of the disclosed sequences, which can be achieved using a variety of approaches. Non-limiting examples of these approaches are described briefly below.

#### 25 Homology to known sequences:

Computer-assisted comparison of the disclosed *S. epidermidis* sequences with previously reported sequences present in publicly available databases is useful for identifying functional *S. epidermidis* nucleic acid and polypeptide sequences. It will be understood that protein-coding sequences, for example, may be compared as a whole, and  
30 that a high degree of sequence homology between two proteins (such as, for example, >80-90%) at the amino acid level indicates that the two proteins also possess some

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degree of functional homology, such as, for example, among enzymes involved in metabolism, DNA synthesis, or cell wall synthesis, and proteins involved in transport, cell division, etc. In addition, many structural features of particular protein classes have been identified and correlate with specific consensus sequences, such as, for example,

5 binding domains for nucleotides, DNA, metal ions, and other small molecules; sites for covalent modifications such as phosphorylation, acylation, and the like; sites of protein:protein interactions, etc. These consensus sequences may be quite short and thus may represent only a fraction of the entire protein-coding sequence. Identification of such a feature in a *S. epidermidis* sequence is therefore useful in determining the function

10 of the encoded protein and identifying useful targets of antibacterial drugs.

Of particular relevance to the present invention are structural features that are common to secretory, transmembrane, and surface proteins, including secretion signal peptides and hydrophobic transmembrane domains. *S. epidermidis* proteins identified as containing putative signal sequences and/or transmembrane domains are useful as

15 immunogenic components of vaccines.

Targets for therapeutic drugs according to the invention include, but are not limited to, polypeptides of the invention, whether unique to *S. epidermidis* or not, that are essential for growth and/or viability of *S. epidermidis* under at least one growth condition. Polypeptides essential for growth and/or viability can be determined by

20 examining the effect of deleting and/or disrupting the genes, i.e., by so-called gene "knockout". Alternatively, genetic footprinting can be used (Smith et al., 1995, Proc. Natl. Acad. Sci. USA 92:5479-6433; Published International Application WO 94/26933; U.S. Patent No. 5,612,180). Still other methods for assessing essentiality includes the ability to isolate conditional lethal mutations in the specific gene (e.g., temperature

25 sensitive mutations). Other useful targets for therapeutic drugs, which include polypeptides that are not essential for growth or viability per se but lead to loss of viability of the cell, can be used to target therapeutic agents to cells.

#### Strain-specific sequences:

30 Because of the evolutionary relationship between different *S. epidermidis* strains, it is believed that the presently disclosed *S. epidermidis* sequences are useful for

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identifying, and/or discriminating between, previously known and new *S. epidermidis* strains. It is believed that other *S. epidermidis* strains will exhibit at least 70% sequence homology with the presently disclosed sequence. Systematic and routine analyses of DNA sequences derived from samples containing *S. epidermidis* strains, and comparison with the present sequence allows for the identification of sequences that can be used to discriminate between strains, as well as those that are common to all *S. epidermidis* strains. In one embodiment, the invention provides nucleic acids, including probes, and peptide and polypeptide sequences that discriminate between different strains of *S. epidermidis*. Strain-specific components can also be identified functionally by their ability to elicit or react with antibodies that selectively recognize one or more *S. epidermidis* strains.

In another embodiment, the invention provides nucleic acids, including probes, and peptide and polypeptide sequences that are common to all *S. epidermidis* strains but are not found in other bacterial species.

#### *S. epidermidis* Polypeptides

This invention encompasses isolated *S. epidermidis* polypeptides encoded by the disclosed *S. epidermidis* genomic sequences, including the polypeptides of the invention contained in the Sequence Listing. Polypeptides of the invention are preferably at least 5 amino acid residues in length. Using the DNA sequence information provided herein, the amino acid sequences of the polypeptides encompassed by the invention can be deduced using methods well-known in the art. It will be understood that the sequence of an entire nucleic acid encoding a *S. epidermidis* polypeptide can be isolated and identified based on an ORF that encodes only a fragment of the cognate protein-coding region. This can be achieved, for example, by using the isolated nucleic acid encoding the ORF, or fragments thereof, to prime a polymerase chain reaction with genomic *S. epidermidis* DNA as template; this is followed by sequencing the amplified product.

The polypeptides of the present invention, including function-conservative variants of the disclosed ORFs, may be isolated from wild-type or mutant *S. epidermidis* cells, or from heterologous organisms or cells (including, but not limited to, bacteria, fungi, insect, plant, and mammalian cells) including *S. epidermidis* into which a *S.*



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epidermidis-derived protein-coding sequence has been introduced and expressed. Furthermore, the polypeptides may be part of recombinant fusion proteins.

5 S. epidermidis polypeptides of the invention can be chemically synthesized using commercially automated procedures such as those referenced herein, including, without limitation, exclusive solid phase synthesis, partial solid phase methods, fragment condensation or classical solution synthesis. The polypeptides are preferably prepared by solid phase peptide synthesis as described by Merrifield, 1963, J. Am. Chem. Soc. 85:2149. The synthesis is carried out with amino acids that are protected at the alpha-amino terminus. Trifunctional amino acids with labile side-chains are also protected with  
10 suitable groups to prevent undesired chemical reactions from occurring during the assembly of the polypeptides. The alpha-amino protecting group is selectively removed to allow subsequent reaction to take place at the amino-terminus. The conditions for the removal of the alpha-amino protecting group do not remove the side-chain protecting groups.

15 Methods for polypeptide purification are well-known in the art, including, without limitation, preparative disc-gel electrophoresis, isoelectric focusing, HPLC, reversed-phase HPLC, gel filtration, ion exchange and partition chromatography, and countercurrent distribution. For some purposes, it is preferable to produce the polypeptide in a recombinant system in which the S. epidermidis protein contains an  
20 additional sequence tag that facilitates purification, such as, but not limited to, a polyhistidine sequence. The polypeptide can then be purified from a crude lysate of the host cell by chromatography on an appropriate solid-phase matrix. Alternatively, antibodies produced against a S. epidermidis protein or against peptides derived therefrom can be used as purification reagents. Other purification methods are possible.

25 The present invention also encompasses derivatives and homologues of S. epidermidis-encoded polypeptides. For some purposes, nucleic acid sequences encoding the peptides may be altered by substitutions, additions, or deletions that provide for functionally equivalent molecules, i.e., function-conservative variants. For example, one or more amino acid residues within the sequence can be substituted by another amino  
30 acid of similar properties, such as, for example, positively charged amino acids (arginine,

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lysine, and histidine); negatively charged amino acids (aspartate and glutamate); polar neutral amino acids; and non-polar amino acids.

The isolated polypeptides may be modified by, for example, phosphorylation, sulfation, acylation, or other protein modifications. They may also be modified with a  
5 label capable of providing a detectable signal, either directly or indirectly, including, but not limited to, radioisotopes and fluorescent compounds.

To identify *S. epidermidis*-derived polypeptides for use in the present invention, essentially the complete genomic sequence of a *Staphylococcus epidermidis* isolate was analyzed.. While, in very rare instances, a nucleic acid sequencing error may be  
10 revealed, resolving a rare sequencing error is well within the art, and such an occurrence will not prevent one skilled in the art from practicing the invention.

Also encompassed are any *S. epidermidis* polypeptide sequences that are contained within the open reading frames (ORFs), including complete protein-coding sequences, of which any of SEQ ID NO: 2838 - SEQ ID NO: 5674 forms a part. Table 2,  
15 which is appended herewith and which forms part of the present specification, provides a putative identification of the particular function of a polypeptide which is encoded by each ORF, based on the homology match (determined by the BLAST algorithm) of the predicted polypeptide with known proteins encoded by ORFs in other organisms. As a result, one skilled in the art can use the polypeptides of the present invention for  
20 commercial and industrial purposes consistent with the type of putative identification of the polypeptide.

The present invention provides a library of *S. epidermidis*-derived polypeptide sequences, and a corresponding library of nucleic acid sequences encoding the polypeptides, wherein the polypeptides themselves, or polypeptides contained within  
25 ORFs of which they form a part, comprise sequences that are contemplated for use as components of vaccines. Non-limiting examples of such sequences are listed by SEQ ID NO in Table 2, which is appended herewith and which forms part of the present specification.

The present invention also provides a library of *S. epidermidis*-derived  
30 polypeptide sequences, and a corresponding library of nucleic acid sequences encoding the polypeptides, wherein the polypeptides themselves, or polypeptides contained within

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ORFs of which they form a part, comprise sequences lacking homology to any known prokaryotic or eukaryotic sequences. Such libraries provide probes, primers, and markers which can be used to diagnose *S. epidermidis* infection, including use as markers in epidemiological studies. Non-limiting examples of such sequences are listed by SEQ ID NO in Table 2, which is appended. The present invention also provides a library of *S. epidermidis*-derived polypeptide sequences, and a corresponding library of nucleic acid sequences encoding the polypeptides, wherein the polypeptides themselves, or polypeptides contained within ORFs of which they form a part, comprise targets for therapeutic drugs.

#### Specific Example: Determination Of Staphylococcus Protein Antigens For Antibody And Vaccine Development

The selection of *Staphylococcus* protein antigens for vaccine development can be derived from the nucleic acids encoding *S. epidermidis* polypeptides. First, the ORF's can be analyzed for homology to other known exported or membrane proteins and analyzed using the discriminant analysis described by Klein, et al. (Klein, P., Kanehsia, M., and DeLisi, C. (1985) *Biochimica et Biophysica Acta* 815, 468-476) for predicting exported and membrane proteins.

Homology searches can be performed using the BLAST algorithm contained in the Wisconsin Sequence Analysis Package (Genetics Computer Group, University Research Park, 575 Science Drive, Madison, WI 53711) to compare each predicted ORF amino acid sequence with all sequences found in the current GenBank, SWISS-PROT and PIR databases. BLAST searches for local alignments between the ORF and the databank sequences and reports a probability score which indicates the probability of finding this sequence by chance in the database. ORF's with significant homology (e.g. probabilities lower than  $1 \times 10^{-6}$  that the homology is only due to random chance) to membrane or exported proteins represent protein antigens for vaccine development. Possible functions can be provided to *S. epidermidis* genes based on sequence homology to genes cloned in other organisms.

Discriminant analysis (Klein, et al. supra) can be used to examine the ORF amino acid sequences. This algorithm uses the intrinsic information contained in the ORF

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amino acid sequence and compares it to information derived from the properties of known membrane and exported proteins. This comparison predicts which proteins will be exported, membrane associated or cytoplasmic. ORF amino acid sequences identified as exported or membrane associated by this algorithm are likely protein antigens for vaccine development.

#### Production of Fragments and Analogs of *S. epidermidis* Nucleic Acids and Polypeptides

Based on the discovery of the *S. epidermidis* gene products of the invention provided in the Sequence Listing, one skilled in the art can alter the disclosed structure of *S. epidermidis* genes, e.g., by producing fragments or analogs, and test the newly produced structures for activity. Examples of techniques known to those skilled in the relevant art which allow the production and testing of fragments and analogs are discussed below. These, or analogous methods can be used to make and screen libraries of polypeptides, e.g., libraries of random peptides or libraries of fragments or analogs of cellular proteins for the ability to bind *S. epidermidis* polypeptides. Such screens are useful for the identification of inhibitors of *S. epidermidis*.

#### Generation of Fragments

Fragments of a protein can be produced in several ways, e.g., recombinantly, by proteolytic digestion, or by chemical synthesis. Internal or terminal fragments of a polypeptide can be generated by removing one or more nucleotides from one end (for a terminal fragment) or both ends (for an internal fragment) of a nucleic acid which encodes the polypeptide. Expression of the mutagenized DNA produces polypeptide fragments. Digestion with "end-nibbling" endonucleases can thus generate DNAs which encode an array of fragments. DNAs which encode fragments of a protein can also be generated by random shearing, restriction digestion or a combination of the above-discussed methods.

Fragments can also be chemically synthesized using techniques known in the art such as conventional Merrifield solid phase f-Moc or t-Boc chemistry. For example, peptides of the present invention may be arbitrarily divided into fragments of desired length with no overlap of the fragments, or divided into overlapping fragments of a desired length.

### Alteration of Nucleic Acids and Polypeptides: Random Methods

Amino acid sequence variants of a protein can be prepared by random mutagenesis of DNA which encodes a protein or a particular domain or region of a  
5 protein. Useful methods include PCR mutagenesis and saturation mutagenesis. A library of random amino acid sequence variants can also be generated by the synthesis of a set of degenerate oligonucleotide sequences. (Methods for screening proteins in a library of variants are elsewhere herein).

#### PCR Mutagenesis

10 In PCR mutagenesis, reduced Taq polymerase fidelity is used to introduce random mutations into a cloned fragment of DNA (Leung et al., 1989, Technique 1:11-15). The DNA region to be mutagenized is amplified using the polymerase chain reaction (PCR) under conditions that reduce the fidelity of DNA synthesis by Taq DNA polymerase, e.g., by using a dGTP/dATP ratio of five and adding Mn<sup>2+</sup> to the PCR reaction. The pool of  
15 amplified DNA fragments are inserted into appropriate cloning vectors to provide random mutant libraries.

#### Saturation Mutagenesis

Saturation mutagenesis allows for the rapid introduction of a large number of single base substitutions into cloned DNA fragments (Mayers et al., 1985, Science  
20 229:242). This technique includes generation of mutations, e.g., by chemical treatment or irradiation of single-stranded DNA in vitro, and synthesis of a complimentary DNA strand. The mutation frequency can be modulated by modulating the severity of the treatment, and essentially all possible base substitutions can be obtained. Because this procedure does not involve a genetic selection for mutant fragments both neutral  
25 substitutions, as well as those that alter function, are obtained. The distribution of point mutations is not biased toward conserved sequence elements.

#### Degenerate Oligonucleotides

A library of homologs can also be generated from a set of degenerate oligonucleotide sequences. Chemical synthesis of a degenerate sequences can be carried  
30 out in an automatic DNA synthesizer, and the synthetic genes then ligated into an appropriate expression vector. The synthesis of degenerate oligonucleotides is known in

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the art (see for example, Narang, SA (1983) Tetrahedron 39:3; Itakura et al. (1981) Recombinant DNA, Proc 3rd Cleveland Sympos. Macromolecules, ed. AG Walton, Amsterdam: Elsevier pp273-289; Itakura et al. (1984) Annu. Rev. Biochem. 53:323; Itakura et al. (1984) Science 198:1056; Ike et al. (1983) Nucleic Acid Res. 11:477. Such

5 techniques have been employed in the directed evolution of other proteins (see, for example, Scott et al. (1990) Science 249:386-390; Roberts et al. (1992) PNAS 89:2429-2433; Devlin et al. (1990) Science 249: 404-406; Cwirla et al. (1990) PNAS 87: 6378-6382; as well as U.S. Patents Nos. 5,223,409, 5,198,346, and 5,096,815).

10 Alteration of Nucleic Acids and Polypeptides: Methods for Directed Mutagenesis

Non-random or directed, mutagenesis techniques can be used to provide specific sequences or mutations in specific regions. These techniques can be used to create variants which include, e.g., deletions, insertions, or substitutions, of residues of the known amino acid sequence of a protein. The sites for mutation can be modified

15 individually or in series, e.g., by (1) substituting first with conserved amino acids and then with more radical choices depending upon results achieved, (2) deleting the target residue, or (3) inserting residues of the same or a different class adjacent to the located site, or combinations of options 1-3.

Alanine Scanning Mutagenesis

20 Alanine scanning mutagenesis is a useful method for identification of certain residues or regions of the desired protein that are preferred locations or domains for mutagenesis, Cunningham and Wells (Science 244:1081-1085, 1989). In alanine scanning, a residue or group of target residues are identified (e.g., charged residues such as Arg, Asp, His, Lys, and Glu) and replaced by a neutral or negatively charged amino

25 acid (most preferably alanine or polyalanine). Replacement of an amino acid can affect the interaction of the amino acids with the surrounding aqueous environment in or outside the cell. Those domains demonstrating functional sensitivity to the substitutions are then refined by introducing further or other variants at or for the sites of substitution. Thus, while the site for introducing an amino acid sequence variation is predetermined,

30 the nature of the mutation per se need not be predetermined. For example, to optimize the performance of a mutation at a given site, alanine scanning or random mutagenesis

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may be conducted at the target codon or region and the expressed desired protein subunit variants are screened for the optimal combination of desired activity.

#### Oligonucleotide-Mediated Mutagenesis

Oligonucleotide-mediated mutagenesis is a useful method for preparing substitution, deletion, and insertion variants of DNA, see, e.g., Adelman et al., (DNA 2:183, 1983). Briefly, the desired DNA is altered by hybridizing an oligonucleotide encoding a mutation to a DNA template, where the template is the single-stranded form of a plasmid or bacteriophage containing the unaltered or native DNA sequence of the desired protein. After hybridization, a DNA polymerase is used to synthesize an entire second complementary strand of the template that will thus incorporate the oligonucleotide primer, and will code for the selected alteration in the desired protein DNA. Generally, oligonucleotides of at least 25 nucleotides in length are used. An optimal oligonucleotide will have 12 to 15 nucleotides that are completely complementary to the template on either side of the nucleotide(s) coding for the mutation. This ensures that the oligonucleotide will hybridize properly to the single-stranded DNA template molecule. The oligonucleotides are readily synthesized using techniques known in the art such as that described by Crea et al. (Proc. Natl. Acad. Sci. USA, 75: 5765[1978]).

#### Cassette Mutagenesis

Another method for preparing variants, cassette mutagenesis, is based on the technique described by Wells et al. (Gene, 34:315[1985]). The starting material is a plasmid (or other vector) which includes the protein subunit DNA to be mutated. The codon(s) in the protein subunit DNA to be mutated are identified. There must be a unique restriction endonuclease site on each side of the identified mutation site(s). If no such restriction sites exist, they may be generated using the above-described oligonucleotide-mediated mutagenesis method to introduce them at appropriate locations in the desired protein subunit DNA. After the restriction sites have been introduced into the plasmid, the plasmid is cut at these sites to linearize it. A double-stranded oligonucleotide encoding the sequence of the DNA between the restriction sites but containing the desired mutation(s) is synthesized using standard procedures. The two strands are synthesized separately and then hybridized together using standard

techniques. This double-stranded oligonucleotide is referred to as the cassette. This cassette is designed to have 3' and 5' ends that are comparable with the ends of the linearized plasmid, such that it can be directly ligated to the plasmid. This plasmid now contains the mutated desired protein subunit DNA sequence.

5           Combinatorial Mutagenesis

Combinatorial mutagenesis can also be used to generate mutants (Ladner et al., WO 88/06630). In this method, the amino acid sequences for a group of homologs or other related proteins are aligned, preferably to promote the highest homology possible. All of the amino acids which appear at a given position of the aligned sequences can be  
10   selected to create a degenerate set of combinatorial sequences. The variegated library of variants is generated by combinatorial mutagenesis at the nucleic acid level, and is encoded by a variegated gene library. For example, a mixture of synthetic oligonucleotides can be enzymatically ligated into gene sequences such that the degenerate set of potential sequences are expressible as individual peptides, or  
15   alternatively, as a set of larger fusion proteins containing the set of degenerate sequences.

Other Modifications of *S. epidermidis* Nucleic Acids and Polypeptides

It is possible to modify the structure of a *S. epidermidis* polypeptide for such purposes as increasing solubility, enhancing stability (e.g., shelf life ex+vivo and  
20   resistance to proteolytic degradation in vivo). A modified *S. epidermidis* protein or peptide can be produced in which the amino acid sequence has been altered, such as by amino acid substitution, deletion, or addition as described herein.

An *S. epidermidis* peptide can also be modified by substitution of cysteine residues preferably with alanine, serine, threonine, leucine or glutamic acid residues to  
25   minimize dimerization via disulfide linkages. In addition, amino acid side chains of fragments of the protein of the invention can be chemically modified. Another modification is cyclization of the peptide.

In order to enhance stability and/or reactivity, a *S. epidermidis* polypeptide can be modified to incorporate one or more polymorphisms in the amino acid sequence of the  
30   protein resulting from any natural allelic variation. Additionally, D-amino acids, non-natural amino acids, or non-amino acid analogs can be substituted or added to produce a



modified protein within the scope of this invention. Furthermore, an *S. epidermidis* polypeptide can be modified using polyethylene glycol (PEG) according to the method of A. Sehon and co-workers (Wie et al., supra) to produce a protein conjugated with PEG. In addition, PEG can be added during chemical synthesis of the protein. Other  
5 modifications of *S. epidermidis* proteins include reduction/alkylation (Tarr, Methods of Protein Microcharacterization, J. E. Silver ed., Humana Press, Clifton NJ 155-194 (1986)); acylation (Tarr, supra); chemical coupling to an appropriate carrier (Mishell and Shiigi, eds, Selected Methods in Cellular Immunology, WH Freeman, San Francisco, CA (1980), U.S. Patent 4,939,239; or mild formalin treatment (Marsh, (1971) Int. Arch. of  
10 Allergy and Appl. Immunol., 41: 199 - 215).

To facilitate purification and potentially increase solubility of a *S. epidermidis* protein or peptide, it is possible to add an amino acid fusion moiety to the peptide backbone. For example, hexa-histidine can be added to the protein for purification by immobilized metal ion affinity chromatography (Hochuli, E. et al., (1988)  
15 Bio/Technology, 6: 1321 - 1325). In addition, to facilitate isolation of peptides free of irrelevant sequences, specific endoprotease cleavage sites can be introduced between the sequences of the fusion moiety and the peptide.

To potentially aid proper antigen processing of epitopes within an *S. epidermidis* polypeptide, canonical protease sensitive sites can be engineered between regions, each  
20 comprising at least one epitope via recombinant or synthetic methods. For example, charged amino acid pairs, such as KK or RR, can be introduced between regions within a protein or fragment during recombinant construction thereof. The resulting peptide can be rendered sensitive to cleavage by cathepsin and/or other trypsin-like enzymes which would generate portions of the protein containing one or more epitopes. In addition, such  
25 charged amino acid residues can result in an increase in the solubility of the peptide.

#### Primary Methods for Screening Polypeptides and Analogs

Various techniques are known in the art for screening generated mutant gene products. Techniques for screening large gene libraries often include cloning the gene  
30 library into replicable expression vectors, transforming appropriate cells with the resulting library of vectors, and expressing the genes under conditions in which detection

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of a desired activity, e.g., in this case, binding to *S. epidermidis* polypeptide or an interacting protein, facilitates relatively easy isolation of the vector encoding the gene whose product was detected. Each of the techniques described below is amenable to high through-put analysis for screening large numbers of sequences created, e.g., by random mutagenesis techniques.

#### Two Hybrid Systems

Two hybrid assays such as the system described below (as with the other screening methods described herein), can be used to identify polypeptides, e.g., fragments or analogs of a naturally-occurring *S. epidermidis* polypeptide, e.g., of cellular proteins, or of randomly generated polypeptides which bind to an *S. epidermidis* protein. (The *S. epidermidis* domain is used as the bait protein and the library of variants are expressed as prey fusion proteins.) In an analogous fashion, a two hybrid assay (as with the other screening methods described herein), can be used to find polypeptides which bind a *S. epidermidis* polypeptide.

#### Display Libraries

In one approach to screening assays, the *Staphylococcus* peptides are displayed on the surface of a cell or viral particle, and the ability of particular cells or viral particles to bind an appropriate receptor protein via the displayed product is detected in a "panning assay". For example, the gene library can be cloned into the gene for a surface membrane protein of a bacterial cell, and the resulting fusion protein detected by panning (Ladner et al., WO 88/06630; Fuchs et al. (1991) *Bio/Technology* 9:1370-1371; and Goward et al. (1992) *TIBS* 18:136-140). In a similar fashion, a detectably labeled ligand can be used to score for potentially functional peptide homologs. Fluorescently labeled ligands, e.g., receptors, can be used to detect homologs which retain ligand-binding activity. The use of fluorescently labeled ligands, allows cells to be visually inspected and separated under a fluorescence microscope, or, where the morphology of the cell permits, to be separated by a fluorescence-activated cell sorter.

A gene library can be expressed as a fusion protein on the surface of a viral particle. For instance, in the filamentous phage system, foreign peptide sequences can be expressed on the surface of infectious phage, thereby conferring two significant benefits. First, since these phage can be applied to affinity matrices at concentrations well over

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1013 phage per milliliter, a large number of phage can be screened at one time. Second, since each infectious phage displays a gene product on its surface, if a particular phage is recovered from an affinity matrix in low yield, the phage can be amplified by another round of infection. The group of almost identical *E. coli* filamentous phages, M13, fd., and f1, are most often used in phage display libraries. Either of the phage gIII or gVIII coat proteins can be used to generate fusion proteins without disrupting the ultimate packaging of the viral particle. Foreign epitopes can be expressed at the NH<sub>2</sub>-terminal end of pIII and phage bearing such epitopes recovered from a large excess of phage lacking this epitope (Ladner et al. PCT publication WO 90/02909; Garrard et al., PCT publication WO 92/09690; Marks et al. (1992) *J. Biol. Chem.* 267:16007-16010; Griffiths et al. (1993) *EMBO J* 12:725-734; Clackson et al. (1991) *Nature* 352:624-628; and Barbas et al. (1992) *PNAS* 89:4457-4461).

A common approach uses the maltose receptor of *E. coli* (the outer membrane protein, LamB) as a peptide fusion partner (Charbit et al. (1986) *EMBO* 5, 3029-3037). Oligonucleotides have been inserted into plasmids encoding the LamB gene to produce peptides fused into one of the extracellular loops of the protein. These peptides are available for binding to ligands, e.g., to antibodies, and can elicit an immune response when the cells are administered to animals. Other cell surface proteins, e.g., OmpA (Schorr et al. (1991) *Vaccines* 91, pp. 387-392), PhoE (Agterberg, et al. (1990) *Gene* 88, 37-45), and PAL (Fuchs et al. (1991) *Bio/Tech* 9, 1369-1372), as well as large bacterial surface structures have served as vehicles for peptide display. Peptides can be fused to pilin, a protein which polymerizes to form the pilus-a conduit for interbacterial exchange of genetic information (Thiry et al. (1989) *Appl. Environ. Microbiol.* 55, 984-993). Because of its role in interacting with other cells, the pilus provides a useful support for the presentation of peptides to the extracellular environment. Another large surface structure used for peptide display is the bacterial motive organ, the flagellum. Fusion of peptides to the subunit protein flagellin offers a dense array of many peptide copies on the host cells (Kuwajima et al. (1988) *Bio/Tech.* 6, 1080-1083). Surface proteins of other bacterial species have also served as peptide fusion partners. Examples include the *Staphylococcus* protein A and the outer membrane IgA protease of *Neisseria* (Hansson et al. (1992) *J. Bacteriol.* 174, 4239-4245 and Klauser et al. (1990) *EMBO J.* 9, 1991-1999).

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In the filamentous phage systems and the LamB system described above, the physical link between the peptide and its encoding DNA occurs by the containment of the DNA within a particle (cell or phage) that carries the peptide on its surface. Capturing the peptide captures the particle and the DNA within. An alternative scheme uses the DNA-binding protein LacI to form a link between peptide and DNA (Cull et al. (1992) PNAS USA 89:1865-1869). This system uses a plasmid containing the LacI gene with an oligonucleotide cloning site at its 3'-end. Under the controlled induction by arabinose, a LacI-peptide fusion protein is produced. This fusion retains the natural ability of LacI to bind to a short DNA sequence known as LacO operator (LacO). By installing two copies of LacO on the expression plasmid, the LacI-peptide fusion binds tightly to the plasmid that encoded it. Because the plasmids in each cell contain only a single oligonucleotide sequence and each cell expresses only a single peptide sequence, the peptides become specifically and stably associated with the DNA sequence that directed its synthesis. The cells of the library are gently lysed and the peptide-DNA complexes are exposed to a matrix of immobilized receptor to recover the complexes containing active peptides. The associated plasmid DNA is then reintroduced into cells for amplification and DNA sequencing to determine the identity of the peptide ligands. As a demonstration of the practical utility of the method, a large random library of dodecapeptides was made and selected on a monoclonal antibody raised against the opioid peptide dynorphin B. A cohort of peptides was recovered, all related by a consensus sequence corresponding to a six-residue portion of dynorphin B. (Cull et al. (1992) Proc. Natl. Acad. Sci. U.S.A. 89-1869)

This scheme, sometimes referred to as peptides-on-plasmids, differs in two important ways from the phage display methods. First, the peptides are attached to the C-terminus of the fusion protein, resulting in the display of the library members as peptides having free carboxy termini. Both of the filamentous phage coat proteins, pIII and pVIII, are anchored to the phage through their C-termini, and the guest peptides are placed into the outward-extending N-terminal domains. In some designs, the phage-displayed peptides are presented right at the amino terminus of the fusion protein. (Cwirla, et al. (1990) Proc. Natl. Acad. Sci. U.S.A. 87, 6378-6382) A second difference is the set of biological biases affecting the population of peptides actually present in the libraries.

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The LacI fusion molecules are confined to the cytoplasm of the host cells. The phage coat fusions are exposed briefly to the cytoplasm during translation but are rapidly secreted through the inner membrane into the periplasmic compartment, remaining anchored in the membrane by their C-terminal hydrophobic domains, with the N-termini, containing the peptides, protruding into the periplasm while awaiting assembly into phage particles. The peptides in the LacI and phage libraries may differ significantly as a result of their exposure to different proteolytic activities. The phage coat proteins require transport across the inner membrane and signal peptidase processing as a prelude to incorporation into phage. Certain peptides exert a deleterious effect on these processes and are underrepresented in the libraries (Gallop et al. (1994) J. Med. Chem. 37(9):1233-1251). These particular biases are not a factor in the LacI display system.

The number of small peptides available in recombinant random libraries is enormous. Libraries of 10<sup>7</sup>-10<sup>9</sup> independent clones are routinely prepared. Libraries as large as 10<sup>11</sup> recombinants have been created, but this size approaches the practical limit for clone libraries. This limitation in library size occurs at the step of transforming the DNA containing randomized segments into the host bacterial cells. To circumvent this limitation, an in vitro system based on the display of nascent peptides in polysome complexes has recently been developed. This display library method has the potential of producing libraries 3-6 orders of magnitude larger than the currently available phage/phagemid or plasmid libraries. Furthermore, the construction of the libraries, expression of the peptides, and screening, is done in an entirely cell-free format.

In one application of this method (Gallop et al. (1994) J. Med. Chem. 37(9):1233-1251), a molecular DNA library encoding 10<sup>12</sup> decapeptides was constructed and the library expressed in an E. coli S30 in vitro coupled transcription/translation system. Conditions were chosen to stall the ribosomes on the mRNA, causing the accumulation of a substantial proportion of the RNA in polysomes and yielding complexes containing nascent peptides still linked to their encoding RNA. The polysomes are sufficiently robust to be affinity purified on immobilized receptors in much the same way as the more conventional recombinant peptide display libraries are screened. RNA from the bound complexes is recovered, converted to cDNA, and amplified by PCR to produce a template for the next round of synthesis and screening. The polysome display method

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can be coupled to the phage display system. Following several rounds of screening, cDNA from the enriched pool of polysomes was cloned into a phagemid vector. This vector serves as both a peptide expression vector, displaying peptides fused to the coat proteins, and as a DNA sequencing vector for peptide identification. By expressing the polysome-derived peptides on phage, one can either continue the affinity selection procedure in this format or assay the peptides on individual clones for binding activity in a phage ELISA, or for binding specificity in a completion phage ELISA (Barret, et al. (1992) Anal. Biochem 204,357-364). To identify the sequences of the active peptides one sequences the DNA produced by the phagemid host.

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#### Secondary Screening of Polypeptides and Analogs

The high through-put assays described above can be followed by secondary screens in order to identify further biological activities which will, e.g., allow one skilled in the art to differentiate agonists from antagonists. The type of a secondary screen used will depend on the desired activity that needs to be tested. For example, an assay can be developed in which the ability to inhibit an interaction between a protein of interest and its respective ligand can be used to identify antagonists from a group of peptide fragments isolated though one of the primary screens described above.

Therefore, methods for generating fragments and analogs and testing them for activity are known in the art. Once the core sequence of interest is identified, it is routine for one skilled in the art to obtain analogs and fragments.

#### Peptide Mimetics of *S. epidermidis* Polypeptides

The invention also provides for reduction of the protein binding domains of the subject *S. epidermidis* polypeptides to generate mimetics, e.g. peptide or non-peptide agents. The peptide mimetics are able to disrupt binding of a polypeptide to its counter ligand, e.g., in the case of a *S. epidermidis* polypeptide binding to a naturally occurring ligand. The critical residues of a subject *S. epidermidis* polypeptide which are involved in molecular recognition of a polypeptide can be determined and used to generate *S. epidermidis*-derived peptidomimetics which competitively or noncompetitively inhibit

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binding of the *S. epidermidis* polypeptide with an interacting polypeptide (see, for example, European patent applications EP-412,762A and EP-B31,080A).

For example, scanning mutagenesis can be used to map the amino acid residues of a particular *S. epidermidis* polypeptide involved in binding an interacting polypeptide, 5 peptidomimetic compounds (e.g. diazepine or isoquinoline derivatives) can be generated which mimic those residues in binding to an interacting polypeptide, and which therefore can inhibit binding of a *S. epidermidis* polypeptide to an interacting polypeptide and thereby interfere with the function of *S. epidermidis* polypeptide. For instance, non-hydrolyzable peptide analogs of such residues can be generated using benzodiazepine 10 (e.g., see Freidinger et al. in *Peptides: Chemistry and Biology*, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), azepine (e.g., see Huffman et al. in *Peptides: Chemistry and Biology*, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), substituted gamma lactam rings (Garvey et al. in *Peptides: Chemistry and Biology*, G.R. Marshall ed., ESCOM Publisher: Leiden, Netherlands, 1988), keto- 15 methylene pseudopeptides (Ewenson et al. (1986) *J Med Chem* 29:295; and Ewenson et al. in *Peptides: Structure and Function* (Proceedings of the 9th American Peptide Symposium) Pierce Chemical Co. Rockland, IL, 1985), b-turn dipeptide cores (Nagai et al. (1985) *Tetrahedron Lett* 26:647; and Sato et al. (1986) *J Chem Soc Perkin Trans* 1:1231), and b-aminoalcohols (Gordon et al. (1985) *Biochem Biophys Res Commun* 20 126:419; and et al. (1986) *Biochem Biophys Res Commun* 134:71).

#### Vaccine Formulations for *S. epidermidis* Nucleic Acids and Polypeptides

This invention also features vaccine compositions for protection against infection by *S. epidermidis* or for treatment of *S. epidermidis* infection, a gram-positive spiral 25 bacterium. In one embodiment, the vaccine compositions contain one or more immunogenic components such as a surface protein from *S. epidermidis*, or portion thereof, and a pharmaceutically acceptable carrier. Nucleic acids within the scope of the invention are exemplified by the nucleic acids of the invention contained in the Sequence Listing which encode *S. epidermidis* surface proteins. Any nucleic acid encoding an 30 immunogenic *S. epidermidis* protein, or portion thereof, which is capable of expression in

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a cell, can be used in the present invention. These vaccines have therapeutic and prophylactic utilities.

One aspect of the invention provides a vaccine composition for protection against infection by *S. epidermidis* which contains at least one immunogenic fragment of an *S.*  
5 *epidermidis* protein and a pharmaceutically acceptable carrier. Preferred fragments include peptides of at least about 10 amino acid residues in length, preferably about 10-20 amino acid residues in length, and more preferably about 12-16 amino acid residues in length.

Immunogenic components of the invention can be obtained, for example, by  
10 screening polypeptides recombinantly produced from the corresponding fragment of the nucleic acid encoding the full-length *S. epidermidis* protein. In addition, fragments can be chemically synthesized using techniques known in the art such as conventional Merrifield solid phase f-Moc or t-Boc chemistry.

In one embodiment, immunogenic components are identified by the ability of the  
15 peptide to stimulate T cells. Peptides which stimulate T cells, as determined by, for example, T cell proliferation or cytokine secretion are defined herein as comprising at least one T cell epitope. T cell epitopes are believed to be involved in initiation and perpetuation of the immune response to the protein allergen which is responsible for the clinical symptoms of allergy. These T cell epitopes are thought to trigger early events at  
20 the level of the T helper cell by binding to an appropriate HLA molecule on the surface of an antigen presenting cell, thereby stimulating the T cell subpopulation with the relevant T cell receptor for the epitope. These events lead to T cell proliferation, lymphokine secretion, local inflammatory reactions, recruitment of additional immune cells to the site of antigen/T cell interaction, and activation of the B cell cascade, leading  
25 to the production of antibodies. A T cell epitope is the basic element, or smallest unit of recognition by a T cell receptor, where the epitope comprises amino acids essential to receptor recognition (e.g., approximately 6 or 7 amino acid residues). Amino acid sequences which mimic those of the T cell epitopes are within the scope of this invention.

Screening immunogenic components can be accomplished using one or more of  
30 several different assays. For example, in vitro, peptide T cell stimulatory activity is assayed by contacting a peptide known or suspected of being immunogenic with an



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antigen presenting cell which presents appropriate MHC molecules in a T cell culture. Presentation of an immunogenic *S. epidermidis* peptide in association with appropriate MHC molecules to T cells in conjunction with the necessary co-stimulation has the effect of transmitting a signal to the T cell that induces the production of increased levels of cytokines, particularly of interleukin-2 and interleukin-4. The culture supernatant can be obtained and assayed for interleukin-2 or other known cytokines. For example, any one of several conventional assays for interleukin-2 can be employed, such as the assay described in Proc. Natl. Acad. Sci USA, 86: 1333 (1989) the pertinent portions of which are incorporated herein by reference. A kit for an assay for the production of interferon is also available from Genzyme Corporation (Cambridge, MA).

Alternatively, a common assay for T cell proliferation entails measuring tritiated thymidine incorporation. The proliferation of T cells can be measured in vitro by determining the amount of <sup>3</sup>H-labeled thymidine incorporated into the replicating DNA of cultured cells. Therefore, the rate of DNA synthesis and, in turn, the rate of cell division can be quantified.

Vaccine compositions of the invention containing immunogenic components (e.g., *S. epidermidis* polypeptide or fragment thereof or nucleic acid encoding an *S. epidermidis* polypeptide or fragment thereof) preferably include a pharmaceutically acceptable carrier. The term "pharmaceutically acceptable carrier" refers to a carrier that does not cause an allergic reaction or other untoward effect in patients to whom it is administered. Suitable pharmaceutically acceptable carriers include, for example, one or more of water, saline, phosphate buffered saline, dextrose, glycerol, ethanol and the like, as well as combinations thereof. Pharmaceutically acceptable carriers may further comprise minor amounts of auxiliary substances such as wetting or emulsifying agents, preservatives or buffers, which enhance the shelf life or effectiveness of the antibody. For vaccines of the invention containing *S. epidermidis* polypeptides, the polypeptide is co-administered with a suitable adjuvant.

It will be apparent to those of skill in the art that the therapeutically effective amount of DNA or protein of this invention will depend, inter alia, upon the administration schedule, the unit dose of antibody administered, whether the protein or

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DNA is administered in combination with other therapeutic agents, the immune status and health of the patient, and the therapeutic activity of the particular protein or DNA.

Vaccine compositions are conventionally administered parenterally, e.g., by injection, either subcutaneously or intramuscularly. Methods for intramuscular immunization are described by Wolff et al. (1990) Science 247: 1465-1468 and by Sedegah et al. (1994) Immunology 91: 9866-9870. Other modes of administration include oral and pulmonary formulations, suppositories, and transdermal applications. Oral immunization is preferred over parenteral methods for inducing protection against infection by *S. epidermidis*. Cain et. al. (1993) Vaccine 11: 637-642. Oral formulations include such normally employed excipients as, for example, pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharine, cellulose, magnesium carbonate, and the like.

The vaccine compositions of the invention can include an adjuvant, including, but not limited to aluminum hydroxide; N-acetyl-muramyl--L-threonyl-D-isoglutamine (thr-MDP); N-acetyl-nor-muramyl-L-alanyl-D-isoglutamine (CGP 11637, referred to as nor-MDP); N-acetylmuramyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1'-2'-dipalmitoyl-sn-glycero-3-hydroxyphosphoryloxy)-ethylamine (CGP 19835A, referred to as MTP-PE); RIBI, which contains three components from bacteria; monophosphoryl lipid A; trehalose dimycolate; cell wall skeleton (MPL + TDM + CWS) in a 2% squalene/Tween 80 emulsion; and cholera toxin. Others which may be used are non-toxic derivatives of cholera toxin, including its B subunit, and/or conjugates or genetically engineered fusions of the *S. epidermidis* polypeptide with cholera toxin or its B subunit, procholeraenoid, fungal polysaccharides, including schizophyllan, muramyl dipeptide, muramyl dipeptide derivatives, phorbol esters, labile toxin of *E. coli*, non-*S. epidermidis* bacterial lysates, block polymers or saponins.

Other suitable delivery methods include biodegradable microcapsules or immunostimulating complexes (ISCOMs), cochleates, or liposomes, genetically engineered attenuated live vectors such as viruses or bacteria, and recombinant (chimeric) virus-like particles, e.g., bluetongue. The amount of adjuvant employed will depend on the type of adjuvant used. For example, when the mucosal adjuvant is cholera toxin, it is suitably used in an amount of 5 mg to 50 mg, for example 10 mg to 35 mg. When used in the

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form of microcapsules, the amount used will depend on the amount employed in the matrix of the microcapsule to achieve the desired dosage. The determination of this amount is within the skill of a person of ordinary skill in the art.

Carrier systems in humans may include enteric release capsules protecting the antigen from the acidic environment of the stomach, and including *S. epidermidis* polypeptide in an insoluble form as fusion proteins. Suitable carriers for the vaccines of the invention are enteric coated capsules and polylactide-glycolide microspheres. Suitable diluents are 0.2 N NaHCO<sub>3</sub> and/or saline.

Vaccines of the invention can be administered as a primary prophylactic agent in adults or in children, as a secondary prevention, after successful eradication of *S. epidermidis* in an infected host, or as a therapeutic agent in the aim to induce an immune response in a susceptible host to prevent infection by *S. epidermidis*. The vaccines of the invention are administered in amounts readily determined by persons of ordinary skill in the art. Thus, for adults a suitable dosage will be in the range of 10 mg to 10 g, preferably 10 mg to 100 mg. A suitable dosage for adults will also be in the range of 5 mg to 500 mg. Similar dosage ranges will be applicable for children. Those skilled in the art will recognize that the optimal dose may be more or less depending upon the patient's body weight, disease, the route of administration, and other factors. Those skilled in the art will also recognize that appropriate dosage levels can be obtained based on results with known oral vaccines such as, for example, a vaccine based on an *E. coli* lysate (6 mg dose daily up to total of 540 mg) and with an enterotoxigenic *E. coli* purified antigen (4 doses of 1 mg) (Schulman et al., *J. Urol.* 150:917-921 (1993); Boedecker et al., *American Gastroenterological Assoc.* 999:A-222 (1993)). The number of doses will depend upon the disease, the formulation, and efficacy data from clinical trials. Without intending any limitation as to the course of treatment, the treatment can be administered over 3 to 8 doses for a primary immunization schedule over 1 month (Boedecker, *American Gastroenterological Assoc.* 888:A-222 (1993)).

In a preferred embodiment, a vaccine composition of the invention can be based on a killed whole *E. coli* preparation with an immunogenic fragment of a *S. epidermidis* protein of the invention expressed on its surface or it can be based on an *E. coli* lysate, wherein the killed *E. coli* acts as a carrier or an adjuvant.

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It will be apparent to those skilled in the art that some of the vaccine compositions of the invention are useful only for preventing *S. epidermidis* infection, some are useful only for treating *S. epidermidis* infection, and some are useful for both preventing and treating *S. epidermidis* infection. In a preferred embodiment, the vaccine composition of the invention provides protection against *S. epidermidis* infection by stimulating humoral and/or cell-mediated immunity against *S. epidermidis*. It should be understood that amelioration of any of the symptoms of *S. epidermidis* infection is a desirable clinical goal, including a lessening of the dosage of medication used to treat *S. epidermidis*-caused disease, or an increase in the production of antibodies in the serum or mucous of patients.

#### Antibodies Reactive With *S. epidermidis* Polypeptides

The invention also includes antibodies specifically reactive with the subject *S. epidermidis* polypeptide. Anti-protein/anti-peptide antisera or monoclonal antibodies can be made by standard protocols (See, for example, *Antibodies: A Laboratory Manual* ed. by Harlow and Lane (Cold Spring Harbor Press: 1988)). A mammal such as a mouse, a hamster or rabbit can be immunized with an immunogenic form of the peptide. Techniques for conferring immunogenicity on a protein or peptide include conjugation to carriers or other techniques well known in the art. An immunogenic portion of the subject *S. epidermidis* polypeptide can be administered in the presence of adjuvant. The progress of immunization can be monitored by detection of antibody titers in plasma or serum. Standard ELISA or other immunoassays can be used with the immunogen as antigen to assess the levels of antibodies.

In a preferred embodiment, the subject antibodies are immunospecific for antigenic determinants of the *S. epidermidis* polypeptides of the invention, e.g. antigenic determinants of a polypeptide of the invention contained in the Sequence Listing, or a closely related human or non-human mammalian homolog (e.g., 90% homologous, more preferably at least 95% homologous). In yet a further preferred embodiment of the invention, the anti-*S. epidermidis* antibodies do not substantially cross react (i.e., react specifically) with a protein which is for example, less than 80% percent homologous to a sequence of the invention contained in the Sequence Listing. By "not substantially cross

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react", it is meant that the antibody has a binding affinity for a non-homologous protein which is less than 10 percent, more preferably less than 5 percent, and even more preferably less than 1 percent, of the binding affinity for a protein of the invention contained in the Sequence Listing. In a most preferred embodiment, there is no cross-  
5 reactivity between bacterial and mammalian antigens.

The term antibody as used herein is intended to include fragments thereof which are also specifically reactive with *S. epidermidis* polypeptides. Antibodies can be fragmented using conventional techniques and the fragments screened for utility in the same manner as described above for whole antibodies. For example, F(ab')<sub>2</sub> fragments  
10 can be generated by treating antibody with pepsin. The resulting F(ab')<sub>2</sub> fragment can be treated to reduce disulfide bridges to produce Fab' fragments. The antibody of the invention is further intended to include bispecific and chimeric molecules having an anti-*S. epidermidis* portion.

Both monoclonal and polyclonal antibodies (Ab) directed against *S. epidermidis* polypeptides or *S. epidermidis* polypeptide variants, and antibody fragments such as Fab' and F(ab')<sub>2</sub>, can be used to block the action of *S. epidermidis* polypeptide and allow the study of the role of a particular *S. epidermidis* polypeptide of the invention in aberrant or unwanted intracellular signaling, as well as the normal cellular function of the *S. epidermidis* and by microinjection of anti-*S. epidermidis* polypeptide antibodies of the  
20 present invention.

Antibodies which specifically bind *S. epidermidis* epitopes can also be used in immunohistochemical staining of tissue samples in order to evaluate the abundance and pattern of expression of *S. epidermidis* antigens. Anti-*S. epidermidis* polypeptide antibodies can be used diagnostically in immuno-precipitation and immuno-blotting to  
25 detect and evaluate *S. epidermidis* levels in tissue or bodily fluid as part of a clinical testing procedure. Likewise, the ability to monitor *S. epidermidis* polypeptide levels in an individual can allow determination of the efficacy of a given treatment regimen for an individual afflicted with such a disorder. The level of a *S. epidermidis* polypeptide can be measured in cells found in bodily fluid, such as in urine samples or can be measured in  
30 tissue, such as produced by gastric biopsy. Diagnostic assays using anti-*S. epidermidis* antibodies can include, for example, immunoassays designed to aid in early diagnosis of

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S. epidermidis infections. The present invention can also be used as a method of detecting antibodies contained in samples from individuals infected by this bacterium using specific S. epidermidis antigens.

Another application of anti-S. epidermidis polypeptide antibodies of the invention is in the immunological screening of cDNA libraries constructed in expression vectors such as (gt11, (gt18-23, (ZAP, and (ORF8. Messenger libraries of this type, having coding sequences inserted in the correct reading frame and orientation, can produce fusion proteins. For instance, (gt11 will produce fusion proteins whose amino termini consist of  $\beta$ -galactosidase amino acid sequences and whose carboxy termini consist of a foreign polypeptide. Antigenic epitopes of a subject S. epidermidis polypeptide can then be detected with antibodies, as, for example, reacting nitrocellulose filters lifted from infected plates with anti-S. epidermidis polypeptide antibodies. Phage, scored by this assay, can then be isolated from the infected plate. Thus, the presence of S. epidermidis gene homologs can be detected and cloned from other species, and alternate isoforms (including splicing variants) can be detected and cloned.

#### Kits Containing Nucleic Acids, Polypeptides or Antibodies of the Invention

The nucleic acid, polypeptides and antibodies of the invention can be combined with other reagents and articles to form kits. Kits for diagnostic purposes typically comprise the nucleic acid, polypeptides or antibodies in vials or other suitable vessels. Kits typically comprise other reagents for performing hybridization reactions, polymerase chain reactions (PCR), or for reconstitution of lyophilized components, such as aqueous media, salts, buffers, and the like. Kits may also comprise reagents for sample processing such as detergents, chaotropic salts and the like. Kits may also comprise immobilization means such as particles, supports, wells, dipsticks and the like. Kits may also comprise labeling means such as dyes, developing reagents, radioisotopes, fluorescent agents, luminescent or chemiluminescent agents, enzymes, intercalating agents and the like. With the nucleic acid and amino acid sequence information provided herein, individuals skilled in art can readily assemble kits to serve their particular purpose. Kits further can include instructions for use.

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Drug Screening Assays Using *S. epidermidis* Polypeptides

By making available purified and recombinant *S. epidermidis* polypeptides, the present invention provides assays which can be used to screen for drugs which are either agonists or antagonists of the normal cellular function, in this case, of the subject *S.*

5 *epidermidis* polypeptides, or of their role in intracellular signaling. Such inhibitors or potentiators may be useful as new therapeutic agents to combat *S. epidermidis* infections in humans. A variety of assay formats will suffice and, in light of the present inventions, will be comprehended by the person skilled in the art.

In many drug screening programs which test libraries of compounds and natural  
10 extracts, high throughput assays are desirable in order to maximize the number of compounds surveyed in a given period of time. Assays which are performed in cell-free systems, such as may be derived with purified or semi-purified proteins, are often preferred as "primary" screens in that they can be generated to permit rapid development and relatively easy detection of an alteration in a molecular target which is mediated by a  
15 test compound. Moreover, the effects of cellular toxicity and/or bioavailability of the test compound can be generally ignored in the in vitro system, the assay instead being focused primarily on the effect of the drug on the molecular target as may be manifest in an alteration of binding affinity with other proteins or change in enzymatic properties of the molecular target. Accordingly, in an exemplary screening assay of the present  
20 invention, the compound of interest is contacted with an isolated and purified *S. epidermidis* polypeptide.

Screening assays can be constructed in vitro with a purified *S. epidermidis* polypeptide or fragment thereof, such as a *S. epidermidis* polypeptide having enzymatic activity, such that the activity of the polypeptide produces a detectable reaction product.  
25 The efficacy of the compound can be assessed by generating dose response curves from data obtained using various concentrations of the test compound. Moreover, a control assay can also be performed to provide a baseline for comparison. Suitable products include those with distinctive absorption, fluorescence, or chemi-luminescence properties, for example, because detection may be easily automated. A variety of  
30 synthetic or naturally occurring compounds can be tested in the assay to identify those which inhibit or potentiate the activity of the *S. epidermidis* polypeptide. Some of these

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active compounds may directly, or with chemical alterations to promote membrane permeability or solubility, also inhibit or potentiate the same activity (e.g., enzymatic activity) in whole, live *S. epidermidis* cells.

#### Overexpression Assays

5 Overexpression assays are based on the premise that overproduction of a protein would lead to a higher level of resistance to compounds that selectively interfere with the function of that protein. Overexpression assays may be used to identify compounds that interfere with the function of virtually any type of protein, including without limitation enzymes, receptors, DNA- or RNA-binding proteins, or any proteins that are directly or  
10 indirectly involved in regulating cell growth.

Typically, two bacterial strains are constructed. One contains a single copy of the gene of interest, and a second contains several copies of the same gene. Identification of useful inhibitory compounds of this type of assay is based on a comparison of the activity of a test compound in inhibiting growth and/or viability of the two strains. The method  
15 involves constructing a nucleic acid vector that directs high level expression of a particular target nucleic acid. The vectors are then transformed into host cells in single or multiple copies to produce strains that express low to moderate and high levels of protein encoding by the target sequence (strain A and B, respectively). Nucleic acid comprising sequences encoding the target gene can, of course, be directly integrated into the host  
20 cell.

Large numbers of compounds (or crude substances which may contain active compounds) are screened for their effect on the growth of the two strains. Agents which interfere with an unrelated target equally inhibit the growth of both strains. Agents which interfere with the function of the target at high concentration should inhibit the growth of  
25 both strains. It should be possible, however, to titrate out the inhibitory effect of the compound in the overexpressing strain. That is, if the compound is affecting the particular target that is being tested, it should be possible to inhibit the growth of strain A at a concentration of the compound that allows strain B to grow.

Alternatively, a bacterial strain is constructed that contains the gene of interest  
30 under the control of an inducible promoter. Identification of useful inhibitory agents using this type of assay is based on a comparison of the activity of a test compound in



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inhibiting growth and/or viability of this strain under both inducing and non-inducing conditions. The method involves constructing a nucleic acid vector that directs high-level expression of a particular target nucleic acid. The vector is then transformed into host cells that are grown under both non-inducing and inducing conditions (conditions A and B, respectively).

Large numbers of compounds (or crude substances which may contain active compounds) are screened for their effect on growth under these two conditions. Agents that interfere with the function of the target should inhibit growth under both conditions. It should be possible, however, to titrate out the inhibitory effect of the compound in the overexpressing strain. That is, if the compound is affecting the particular target that is being tested, it should be possible to inhibit growth under condition A at a concentration that allows the strain to grow under condition B.

#### Ligand-binding Assays

Many of the targets according to the invention have functions that have not yet been identified. Ligand-binding assays are useful to identify inhibitor compounds that interfere with the function of a particular target, even when that function is unknown. These assays are designed to detect binding of test compounds to particular targets. The detection may involve direct measurement of binding. Alternatively, indirect indications of binding may involve stabilization of protein structure or disruption of a biological function. Non-limiting examples of useful ligand-binding assays are detailed below.

A useful method for the detection and isolation of binding proteins is the Biomolecular Interaction Assay (BIAcore) system developed by Pharmacia Biosensor and described in the manufacturer's protocol (LKB Pharmacia, Sweden). The BIAcore system uses an affinity purified anti-GST antibody to immobilize GST-fusion proteins onto a sensor chip. The sensor utilizes surface plasmon resonance which is an optical phenomenon that detects changes in refractive indices. In accordance with the practice of the invention, a protein of interest is coated onto a chip and test compounds are passed over the chip. Binding is detected by a change in the refractive index (surface plasmon resonance).

A different type of ligand-binding assay involves scintillation proximity assays (SPA, described in U.S. Patent No. 4,568,649).

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Another type of ligand binding assay, also undergoing development, is based on the fact that proteins containing mitochondrial targeting signals are imported into isolated mitochondria in vitro (Hurt et al., 1985, *Embo J.* 4:2061-2068; Eilers and Schatz, *Nature*, 1986, 322:228-231). In a mitochondrial import assay, expression vectors are constructed in which nucleic acids encoding particular target proteins are inserted downstream of sequences encoding mitochondrial import signals. The chimeric proteins are synthesized and tested for their ability to be imported into isolated mitochondria in the absence and presence of test compounds. A test compound that binds to the target protein should inhibit its uptake into isolated mitochondria in vitro.

Another ligand-binding assay is the yeast two-hybrid system (Fields and Song, 1989, *Nature* 340:245-246). The yeast two-hybrid system takes advantage of the properties of the GAL4 protein of the yeast *Saccharomyces cerevisiae*. The GAL4 protein is a transcriptional activator required for the expression of genes encoding enzymes of galactose utilization. This protein consists of two separable and functionally essential domains: an N-terminal domain which binds to specific DNA sequences (UASG); and a C-terminal domain containing acidic regions, which is necessary to activate transcription. The native GAL4 protein, containing both domains, is a potent activator of transcription when yeast are grown on galactose media. The N-terminal domain binds to DNA in a sequence-specific manner but is unable to activate transcription. The C-terminal domain contains the activating regions but cannot activate transcription because it fails to be localized to UASG. In the two-hybrid system, a system of two hybrid proteins containing parts of GAL4: (1) a GAL4 DNA-binding domain fused to a protein 'X' and (2) a GAL4 activation region fused to a protein 'Y'. If X and Y can form a protein-protein complex and reconstitute proximity of the GAL4 domains, transcription of a gene regulated by UASG occurs. Creation of two hybrid proteins, each containing one of the interacting proteins X and Y, allows the activation region of UASG to be brought to its normal site of action.

The binding assay described in Fodor et al., 1991, *Science* 251:767-773, which involves testing the binding affinity of test compounds for a plurality of defined polymers synthesized on a solid substrate, may also be useful.

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Compounds which bind to the polypeptides of the invention are potentially useful as antibacterial agents for use in therapeutic compositions.

Pharmaceutical formulations suitable for antibacterial therapy comprise the antibacterial agent in conjunction with one or more biologically acceptable carriers.

- 5 Suitable biologically acceptable carriers include, but are not limited to, phosphate-buffered saline, saline, deionized water, or the like. Preferred biologically acceptable carriers are physiologically or pharmaceutically acceptable carriers.

- The antibacterial compositions include an antibacterial effective amount of active agent. Antibacterial effective amounts are those quantities of the antibacterial agents of the present invention that afford prophylactic protection against bacterial infections or which result in amelioration or cure of an existing bacterial infection. This antibacterial effective amount will depend upon the agent, the location and nature of the infection, and the particular host. The amount can be determined by experimentation known in the art, such as by establishing a matrix of dosages and frequencies and comparing a group of experimental units or subjects to each point in the matrix.
- 10
- 15

- The antibacterial active agents or compositions can be formed into dosage unit forms, such as for example, creams, ointments, lotions, powders, liquids, tablets, capsules, suppositories, sprays, aerosols or the like. If the antibacterial composition is formulated into a dosage unit form, the dosage unit form may contain an antibacterial effective amount of active agent. Alternatively, the dosage unit form may include less than such an amount if multiple dosage unit forms or multiple dosages are to be used to administer a total dosage of the active agent. Dosage unit forms can include, in addition, one or more excipient(s), diluent(s), disintegrant(s), lubricant(s), plasticizer(s), colorant(s), dosage vehicle(s), absorption enhancer(s), stabilizer(s), bactericide(s), or the like.
- 20
- 25

- For general information concerning formulations, see, e.g., Gilman et al. (eds.), 1990, Goodman and Gilman's: The Pharmacological Basis of Therapeutics, 8th ed., Pergamon Press; and Remington's Pharmaceutical Sciences, 17th ed., 1990, Mack Publishing Co., Easton, PA; Avis et al. (eds.), 1993, Pharmaceutical Dosage Forms: Parenteral Medications, Dekker, New York; Lieberman et al (eds.), 1990, Pharmaceutical Dosage Forms: Disperse Systems, Dekker, New York.
- 30

The antibacterial agents and compositions of the present invention are useful for preventing or treating *S. epidermidis* infections. Infection prevention methods incorporate a prophylactically effective amount of an antibacterial agent or composition. A prophylactically effective amount is an amount effective to prevent *S. epidermidis* infection and will depend upon the specific bacterial strain, the agent, and the host. These amounts can be determined experimentally by methods known in the art and as described above.

*S. epidermidis* infection treatment methods incorporate a therapeutically effective amount of an antibacterial agent or composition. A therapeutically effective amount is an amount sufficient to ameliorate or eliminate the infection. The prophylactically and/or therapeutically effective amounts can be administered in one administration or over repeated administrations. Therapeutic administration can be followed by prophylactic administration, once the initial bacterial infection has been resolved.

The antibacterial agents and compositions can be administered topically or systemically. Topical application is typically achieved by administration of creams, ointments, lotions, or sprays as described above. Systemic administration includes both oral and parental routes. Parental routes include, without limitation, subcutaneous, intramuscular, intraperitoneal, intravenous, transdermal, inhalation and intranasal administration.

## EXEMPLIFICATION

### Cloning and Sequencing *S. epidermidis* Genomic Sequence

This invention provides nucleotide sequences of the genome of *S. epidermidis* which thus comprises a DNA sequence library of *S. epidermidis* genomic DNA. The detailed description that follows provides nucleotide sequences of *S. epidermidis*, and also describes how the sequences were obtained and how ORFs (Open Reading Frames) and protein-coding sequences can be identified. Also described are methods of using the disclosed *S. epidermidis* sequences in methods including diagnostic and therapeutic applications. Furthermore, the library can be used as a database for identification and

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comparison of medically important sequences in this and other strains of *S. epidermidis* as well as other species of *Staphylococcus*.

Chromosomal DNA from strain 19804 of *S. epidermidis* was isolated after Zymolyase digestion, sodium dodecyl sulfate lysis, potassium acetate precipitation, phenol:chloroform extraction and ethanol precipitation (Soll, D.R., T. Srikantha and S.R. Lockhart: Characterizing Developmentally Regulated Genes in *S. epidermidis*. In Microbial Genome Methods. K.W. Adolph, editor. CRC Press. New York. p 17-37.). Genomic *S. epidermidis* DNA was hydrodynamically sheared in an HPLC and then separated on a standard 1% agarose gel. Fractions corresponding to 2500-3000 bp in length were excised from the gel and purified by the GeneClean procedure (Bio101, Inc.).

The purified DNA fragments were then blunt-ended using T4 DNA polymerase. The healed DNA was then ligated to unique BstXI-linker adapters (5'-GTCTTCACCACGGGG-3' and 5'-GTGGTGAAGAC-3' in 100-1000 fold molar excess). These linkers are complimentary to the BstXI-cut pGTC vector, while the overhang is not self-complimentary. Therefore, the linkers will not concatemerize nor will the cut-vector religate itself easily. The linker-adapted inserts were separated from the unincorporated linkers on a 1% agarose gel and purified using GeneClean. The linker-adapted inserts were then ligated to BstXI-cut vector to construct a shotgun cDNA subclone libraries.

Only major modifications to the protocols are highlighted. Briefly, the library was then transformed into DH5 $\alpha$  competent cells (Gibco/BRL, DH5 $\alpha$  transformation protocol). It was assessed by plating onto antibiotic plates containing ampicillin and IPTG/Xgal. The plates were incubated overnight at 37°C. Transformants were then used for plating of clones and picking for sequencing. The cultures were grown overnight at 37°C. DNA was purified using a silica bead DNA preparation (Engelstein, 1996) method. In this manner, 25  $\mu$ g of DNA was obtained per clone.

These purified DNA samples were then sequenced using primarily ABI dye-terminator chemistry. All subsequent steps were based on sequencing by ABI377 automated DNA sequencing methods. The ABI dye terminator sequence reads were run on ABI377 machines and the data was transferred to UNIX machines following lane tracking of the gels. Base calls and quality scores were determined using the program

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PHRED (Ewing et al., 1998, Genome Res. 8: 175-185; Ewing and Green, 1998, Genome Res. 8: 685-734). Reads were assembled using PHRAP (P. Green, Abstracts of DOE Human Genome Program Contractor-Grantee Workshop V, Jan. 1996, p.157) with default program parameters and quality scores. The initial assembly was done at 2.3-fold coverage and yielded 5821 contigs.

Finishing can follow the initial assembly. Missing mates (sequences from clones that only gave reads from one end of the *Staphylococcus* DNA inserted in the plasmid) can be identified and sequenced with ABI technology to allow the identification of additional overlapping contigs.

End-sequencing of randomly picked genomic lambda was also performed. Sequencing on a both sides was done for all lambda sequences. The lambda library backbone helped to verify the integrity of the assembly and allowed closure of some of the physical gaps. Primers for walking off the ends of contigs would be selected using pick\_primer ( a GTC program) near the ends of the clones to facilitate gap closure. These walks can be sequenced using the selected clones and primers. These data are then reassembled with PHRAP. Additional sequencing using PCR-generated templates and screened and/or unscreened lambda templates can be done in addition.

To identify *S. epidermidis* polypeptides the complete genomic sequence of *S. epidermidis* were analyzed essentially as follows: First, all possible stop-to- stop open reading frames (ORFs) greater than 180 nucleotides in all six reading frames were translated into amino acid sequences. Second, the identified ORFs were analyzed for homology to known (archeabacter, prokaryotic and eukaryotic) protein sequences. Third, the coding potential of non-homologous sequences were evaluated with the program GENEMARKTM (Borodovsky and McIninch, 1993, Comp. Chem. 17:123).

EE341901427US Identification, Cloning and Expression of *S. epidermidis* Nucleic Acids

Expression and purification of the *S. epidermidis* polypeptides of the invention can be performed essentially as outlined below.

To facilitate the cloning, expression and purification of membrane and secreted proteins from *S. epidermidis*, a gene expression system, such as the pET System (Novagen), for cloning and expression of recombinant proteins in *E. coli*, is selected. Also, a DNA sequence encoding a peptide tag, the His-Tag, is fused to the 3' end of DNA

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sequences of interest in order to facilitate purification of the recombinant protein products. The 3' end is selected for fusion in order to avoid alteration of any 5' terminal signal sequence.

#### PCR Amplification and Cloning of Nucleic Acids Containing ORF's Encoding Enzymes

5 Nucleic acids chosen (for example, from the nucleic acids set forth in SEQ ID NO: 1 - SEQ ID NO: 2837) for cloning from the 18972 strain of *S. epidermidis* are prepared for amplification cloning by polymerase chain reaction (PCR). Synthetic oligonucleotide primers specific for the 5' and 3' ends of open reading frames (ORFs) are designed and purchased from GibcoBRL Life Technologies (Gaithersburg, MD, 10 USA). All forward primers (specific for the 5' end of the sequence) are designed to include an NcoI cloning site at the extreme 5' terminus. These primers are designed to permit initiation of protein translation at a methionine residue followed by a valine residue and the coding sequence for the remainder of the native *S. epidermidis* DNA sequence. All reverse primers (specific for the 3' end of any *S. epidermidis* ORF) 15 include a EcoRI site at the extreme 5' terminus to permit cloning of each *S. epidermidis* sequence into the reading frame of the pET-28b. The pET-28b vector provides sequence encoding an additional 20 carboxy-terminal amino acids including six histidine residues (at the extreme C-terminus), which comprise the His-Tag.

Genomic DNA prepared from the 18972 strain of *S. epidermidis* is used as the 20 source of template DNA for PCR amplification reactions (Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994). To amplify a DNA sequence containing a *S. epidermidis* ORF, genomic DNA (50 nanograms) is introduced into a reaction vial containing 2 mM MgCl<sub>2</sub>, 1 micromolar synthetic oligonucleotide primers (forward and reverse primers) complementary to and flanking a defined *S.* 25 *epidermidis* ORF, 0.2 mM of each deoxynucleotide triphosphate; dATP, dGTP, dCTP, dTTP and 2.5 units of heat stable DNA polymerase (Amplitaq, Roche Molecular Systems, Inc., Branchburg, NJ, USA) in a final volume of 100 microliters.

Upon completion of thermal cycling reactions, each sample of amplified DNA is washed and purified using the Qiaquick Spin PCR purification kit (Qiagen, Gaithersburg, 30 MD, USA). All amplified DNA samples are subjected to digestion with the restriction endonucleases, e.g., NcoI and EcoRI (New England BioLabs, Beverly, MA,

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USA)(Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994). DNA samples are then subjected to electrophoresis on 1.0 % NuSeive (FMC BioProducts, Rockland, ME USA) agarose gels. DNA is visualized by exposure to ethidium bromide and long wave uv irradiation. DNA contained in slices isolated from the agarose gel is purified using the Bio 101 GeneClean Kit protocol (Bio 101 Vista, CA, USA).

#### Cloning of *S. epidermidis* Nucleic Acids Into an Expression Vector

The pET-28b vector is prepared for cloning by digestion with restriction endonucleases, e.g., NcoI and EcoRI (Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994). The pET-28a vector, which encodes a His-Tag that can be fused to the 5/ end of an inserted gene, is prepared by digestion with appropriate restriction endonucleases.

Following digestion, DNA inserts are cloned (Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994) into the previously digested pET-28b expression vector. Products of the ligation reaction are then used to transform the BL21 strain of *E. coli* (Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994) as described below.

#### Transformation Of Competent Bacteria With Recombinant Plasmids

Competent bacteria, *E. coli* strain BL21 or *E. coli* strain BL21(DE3), are transformed with recombinant pET expression plasmids carrying the cloned *S. epidermidis* sequences according to standard methods (Current Protocols in Molecular, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994). Briefly, 1 microliter of ligation reaction is mixed with 50 microliters of electrocompetent cells and subjected to a high voltage pulse, after which, samples are incubated in 0.45 milliliters SOC medium (0.5% yeast extract, 2.0 % tryptone, 10 mM NaCl, 2.5 mM KCl, 10 mM MgCl<sub>2</sub>, 10 mM MgSO<sub>4</sub> and 20, mM glucose) at 37°C with shaking for 1 hour. Samples are then spread on LB agar plates containing 25 microgram/ml kanamycin sulfate for growth overnight. Transformed colonies of BL21 are then picked and analyzed to evaluate cloned inserts as described below.



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### Identification Of Recombinant Expression Vectors With *S. epidermidis* Nucleic Acids

Individual BL21 clones transformed with recombinant pET-28b *S. epidermidis* ORFs are analyzed by PCR amplification of the cloned inserts using the same forward and reverse primers, specific for each *S. epidermidis* sequence, that were used in the original PCR amplification cloning reactions. Successful amplification verifies the integration of the *S. epidermidis* sequences in the expression vector (Current Protocols in Molecular Biology, John Wiley and Sons, Inc., F. Ausubel et al., eds., 1994).

### Isolation and Preparation of Nucleic Acids From Transformants

Individual clones of recombinant pET-28b vectors carrying properly cloned *S. epidermidis* ORFs are picked and incubated in 5 mls of LB broth plus 25 microgram/ml kanamycin sulfate overnight. The following day plasmid DNA is isolated and purified using the Qiagen plasmid purification protocol (Qiagen Inc., Chatsworth, CA, USA).

### Expression Of Recombinant *S. epidermidis* Sequences In *E. coli*

The pET vector can be propagated in any *E. coli* K-12 strain e.g. HMS174, HB101, JM109, DH5, etc. for the purpose of cloning or plasmid preparation. Hosts for expression include *E. coli* strains containing a chromosomal copy of the gene for T7 RNA polymerase. These hosts are lysogens of bacteriophage DE3, a lambda derivative that carries the *lacI* gene, the *lacUV5* promoter and the gene for T7 RNA polymerase. T7 RNA polymerase is induced by addition of isopropyl-B-D-thiogalactoside (IPTG), and the T7 RNA polymerase transcribes any target plasmid, such as pET-28b, carrying its gene of interest. Strains used include: BL21(DE3) (Studier, F.W., Rosenberg, A.H., Dunn, J.J., and Dubendorff, J.W. (1990) Meth. Enzymol. 185, 60-89).

To express recombinant *S. epidermidis* sequences, 50 nanograms of plasmid DNA isolated as described above is used to transform competent BL21(DE3) bacteria as described above (provided by Novagen as part of the pET expression system kit). The *lacZ* gene (beta-galactosidase) is expressed in the pET-System as described for the *S. epidermidis* recombinant constructions. Transformed cells are cultured in SOC medium for 1 hour, and the culture is then plated on LB plates containing 25 micrograms/ml kanamycin sulfate. The following day, bacterial colonies are pooled and grown in LB medium containing kanamycin sulfate (25 micrograms/ml) to an optical density at 600

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nM of 0.5 to 1.0 O.D. units, at which point, 1 millimolar IPTG was added to the culture for 3 hours to induce gene expression of the *S. epidermidis* recombinant DNA constructions.

After induction of gene expression with IPTG, bacteria are pelleted by  
5 centrifugation in a Sorvall RC-3B centrifuge at 3500 x g for 15 minutes at 4oC. Pellets are resuspended in 50 milliliters of cold 10 mM Tris-HCl, pH 8.0, 0.1 M NaCl and 0.1 mM EDTA (STE buffer). Cells are then centrifuged at 2000 x g for 20 min at 4oC. Wet pellets are weighed and frozen at -80oC until ready for protein purification.

A variety of methodologies known in the art can be utilized to purify the isolated  
10 proteins. (Current Protocols in Protein Science, John Wiley and Sons, Inc., J. E. Coligan et al., eds., 1995). For example, the frozen cells may be thawed, resuspended in buffer and ruptured by several passages through a small volume microfluidizer (Model M-110S, Microfluidics International Corporation, Newton, MA). The resultant homogenate may be centrifuged to yield a clear supernatant (crude extract) and following filtration the  
15 crude extract may be fractionated over columns. Fractions may be monitored by absorbance at OD280 nm. and peak fractions may analyzed by SDS-PAGE

The concentrations of purified protein preparations may be quantified spectrophotometrically using absorbance coefficients calculated from amino acid content (Perkins, S.J. 1986 Eur. J. Biochem. 157, 169-180). Protein concentrations are also  
20 measured by the method of Bradford, M.M. (1976) Anal. Biochem. 72, 248-254, and Lowry, O.H., Rosebrough, N., Farr, A.L. & Randall, R.J. (1951) J. Biol. Chem. 193, pages 265-275, using bovine serum albumin as a standard.

SDS-polyacrylamide gels of various concentrations may be purchased from BioRad (Hercules, CA, USA), and stained with Coomassie blue. Molecular weight  
25 markers may include rabbit skeletal muscle myosin (200 kDa), E. coli (-galactosidase (116 kDa), rabbit muscle phosphorylase B (97.4 kDa), bovine serum albumin (66.2 kDa), ovalbumin (45 kDa), bovine carbonic anhydrase (31 kDa), soybean trypsin inhibitor (21.5 kDa), egg white lysozyme (14.4 kDa) and bovine aprotinin (6.5 kDa).

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## EQUIVALENTS

Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments and methods described herein. The specific embodiments described herein are offered by way of  
5 example only , and the invention is to limited only by the terms of the appended claims, along with the full scope of equivalents to which such claims are entitled.

Table 2

Contig	Orf	ntID	aaID	nt Length	aa Length	Blast Score	Blast Probability	Subject Taxonomy	Subject Name	Subject Definition
Contig001D	14634450_c1_1	1	2838	204	68					
Contig001D	24225000_c3_3	2	2839	342	114	152	4.80E-11	Archaeoglobus fulgidus	g2649613	AF0984ABC transporter, ATP-binding protein Archaeoglobus fulgidus section 71 of 172 of the complete genome.similar to SP
Contig001D	801552_c2_2	3	2840	381	127					
Contig002D	32204583_f2_4	4	2841	198	66					
Contig002D	34101427_c3_13	5	2842	549	183	301	7.80E-27	Haemophilus influenzae	P44609	H10277hypotheticalHaemophilus influenzae from bases 308943 to 320513 (section 29 of 163) of the complete genome.similar to SP
Contig002D	39113327_c2_11	6	2843	243	81					
Contig003D	16972205_f1_1	7	2844	240	80	192	3.70E-14	Pseudomonas putida	g1778585	catCstationary-phase inducible catalase CPseudomonas putida stationary-phase inducible catalase C (catC)gene, complete code
Contig003D	31817898_c3_14	8	2845	249	83					
Contig003D	3220277_f1_2	9	2846	735	245					
Contig003D	6773543_f3_5	10	2847	267	89					
Contig004D	29339567_f3_3	11	2848	237	79					
Contig005D	197187_f2_3	12	2849	324	108	252	1.20E-21	Haemophilus influenzae	P44862	H10754glucokinase regulatorHaemophilus influenzae from bases 809329 to 819404 (section 74 of 163) of the complete genome.similar to SP
Contig005D	33214506_f1_1	13	2850	888	296	206	3.50E-15	Borrelia burgdorferi	g2689897	BBB07outer surface protein, putativeBorrelia burgdorferi plasmid cp26, complete plasmid sequence.similar to GB
Contig006D	14566626_f2_4	14	2851	228	76					
Contig006D	15661656_c1_12	15	2852	186	62					
Contig006D	16601688_c2_13	16	2853	1368	456	156	2.30E-08	Caenorhabditis elegans	e229183	C11G6.3Caenorhabditis elegans cosmid C11G6, complete sequence.cDNA EST CEESG55F comes from this gene
Contig006D	24476091_c1_11	17	2854	444	148	127	1.10E-07	Orf virus	g332564	ORF5 proteinOrf virus homologue of retroviral pseudoprotease gene, completecds. ORF5

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Contig006D	24867191_c3_14	18	2855	267	89	108	1.60E-05	Caenorhabditis elegans	e229183	C11G6.3Caenorhabditis elegans cosmid C11G6, complete sequence.cDNA EST CEESG55F comes from this gene
Contig006D	34180317_c1_10	19	2856	357	119	169	7.00E-12	SACCHAROMYCES CEREVISIAE	P36043	YKL201C Hypothetical protein YKL201c64.6 KD PROTEIN IN TOR2-PASI INTERGENIC REGION
Contig007D	1959693_c2_1	20	2857	195	65					
Contig008D	2776391_f2_1	21	2858	207	69					
Contig008D	4304683_c1_3	22	2859	396	132	571	1.90E-55	Plasmid pIM13	P13956	mls macrolide-lincosamide-streptogramin B-resistance Plasmid pIM13 (from B.subtilis), complete genome, encoding a possible replication protein and macrolide-lincosamide-streptogramin B resistance protein, complete cds.rRNA (adenine-N6-)-methyltransferase
Contig008D	976035_c3_4	23	2860	405	135	662	4.40E-65	Staphylococcus chromogenes	g2317796	rRNA N-6-methyltransferaseStaphylococcus chromogenes plasmid pPV141 erythromycin resistance plasmid, rRNA N-6-methyltransferase (ermM) and plasmid replication protein genes, complete cds.
Contig009D	2349191_f2_2	24	2861	321	107	149	7.90E-10	Acinetobacter sp. ADP1	g2352826	benK benzoate transport proteinAcinetobacter sp. ADP1 ben operon and cat operon, complete sequence.
Contig009D	31770762_c2_5	25	2862	735	245					
Contig009D	45605468_c3_6	26	2863	312	104					
Contig009D	9961566_f3_3	27	2864	819	273	947	2.70E-95	Plasmid pWW0	P23102	xylL1,2-dihydroxycyclohexa-3,4-diene carboxylatePseudomonas putida plasmid pWW0 meta operon, 5' genes.
Contig010D	10980305_c3_12	28	2865	189	63					
Contig010D	11075275_f3_7	29	2866	564	188					

Contig	33614811_fl_1	30	2867	504	168	274	5.70E-24	Bacillus subtilis	g1934656	yrdO
Contig010D										Ocation transport protein YrdO Bacillus subtilis aminoglycoside 6-adenylyltransferase (aadK) gene, partial cds, and YrdA (yrdA), YrdB (yrdB), hypothetical protein YrdC (yrdC), YrdD (yrdD), hypothetical cytochrome P450 protein YrdE(yrdE), ribonuclease inhI
Contig010D	4968908_c2_11	31	2868	729	243	195	1.90E-14	Escherichia coli	P11585	relAGTP pyrophosphokinase Escherichia coli K-12 MG1655 section 252 of 400 of the complete genome.guanosine 3',5'-bis(diphosphate) 3'-pyrophosphatase f744; 99 pct identical to RELA_ECOLI SW
Contig011D	11724141_f2_4	32	2869	750	250	139	3.20E-07	Plasmodium vivax	g482894	circumsporozoite protein Plasmodium vivax isolate SOL101 circumsporozoite protein gene, partial cds.
Contig011D	22772930_c1_7	33	2870	357	119	114	1.60E-06	Homo sapiens	A60533	tumor-associated antigen DF3
Contig011D	26770911_f3_5	34	2871	852	284	328	1.10E-29	Mycobacterium tuberculosis	e319154	MT1376.03cunknownMycobacterium tuberculosis cosmid I376.MT1376.03c, unknown, len
Contig013D	12542203_f2_1	35	2872	699	233					Rhizobium leguminosarum bv. trifolii TfuA (tfuA), gene, completed.cds.ORF1; high similarity to members of the LysR ypaQtransport proteinBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.26% of identity to the Bacillus caldolyticus uracil
Contig014D	16254012_c2_18	36	2873	627	209	340	5.80E-31	Rhizobium leguminosarum bv. trifolii	g1439550	histidine-rich calcium-binding protein precursorRabbit histidine-rich calcium-binding protein mRNA, complete cds.histidine-rich calcium-binding protein
Contig014D	24020200_f3_13	37	2874	1044	348	620	1.20E-60	Bacillus subtilis	P42086	
Contig014D	26377261_c2_17	38	2875	624	208	122	6.30E-05	Oryctolagus cuniculus	P16230	
Contig014D										
Contig014D	36581376_f2_9	39	2876	192	64					
Contig015D	14109413_c2_14	40	2877	741	247	608	2.30E-59	Haemophilus influenzae	P44849	HI0736sodium-dependent noradrenaline transporterHaemophilus influenzae from bases 788391 to 799271 (section 72 of163) of the complete genome.similar to SP

Contig015D	26462913_c1_10	41	2878	183	61					Synechocystis sp.	d1017357	mrsApeptide methionine sulfoxide reductaseSynechocystis sp. PCC6803 complete genome, 1/27, 1-133859.ORF ID
Contig015D	29964176_f1_2	42	2879	279	93	210	3.40E-17					
Contig015D	30257686_f3_6	43	2880	240	80							
Contig015D	36020031_f3_8	44	2881	387	129							
Contig015D	36441953_f1_3	45	2882	450	150	324	2.90E-29			Escherichia coli g1790665		mrsApeptide methionine sulfoxide reductaseEscherichia coli K-12 MG1655 section 383 of 400 of the completegenome.f212; 100 pct identical amino acid sequence and
Contig015D	7036628_c1_11	46	2883	339	113							
Contig016D	16507686_c2_9	47	2884	186	62							
Contig016D	26853200_c1_8	48	2885	1287	429	263	3.90E-20			Escherichia coli P23886		cysCTransport ATP-binding protein CydCEscherichia coli genomic DNA.(19.9 -20.2 min).unassigned ATP-binding cassette proteinsf573; 100 pct identical to CYDC_ECOLI SW
Contig016D	286293_f3_7	49	2886	192	64							
Contig017D	20423412_f3_4	50	2887	324	108							
Contig017D	26580008_f3_3	51	2888	195	65							
Contig061D	10556712_c3_208	52	2889	990	330	1667	1.40E-171			Staphylococcus aureus	g1408063	mecRmethicillin-resistance proteinStaphylococcus aureus methicillin-resistance protein (mecR) geneand unknown ORF, complete cds.putative
Contig061D	10634800_c1_138	53	2890	966	322	143	2.00E-07			Bacillus subtilis	g2619048	yobVtranscription regulatorBacillus subtilis chromosome region between terC and odhAB.similar to Mycobacterium tuberculosis hypothetical
Contig061D	10928_c2_207	54	2891	1242	414	240	6.90E-18			Rhodobacter capsulatus	g3128293	hypothetical proteinRhodobacter capsulatus strain SB1003, partial genome.
Contig061D	111500_c3_227	55	2892	546	182	101	1.60E-05			Listeria monocytogenes	g940753	iapinvasive associated proteinL.monocytogenes type 2 partial iap gene (strain 64.1.1).invades nonprofessional phagocytic cells

Contig061D	1379132_c1_133	56	2893	564	188	446	3.40E-42	Bacillus anthracis	g929972	Bacillus anthracis Weybridge A toxin plasmid pXOI right inverted repeat element (WeyAR) bordering the toxin-encoding region, ORFA and ORFB genes, complete cds. ORFB; similar to B. anthracis SterneL element ORFB;
Contig061D	13828575_f1_15	57	2894	444	148	617	2.60E-60	Plasmid p1258	P30330	arsCarSenate reductasePlasmid p1258 arsenic resistance operon (arsRBC) genes, complete cds. protein-tyrosine-phosphatase, low molecular weight
Contig061D	1384628_f2_70	58	2895	1278	426	251	3.60E-19	Methanococcus jannaschii	g1522674	MJECL41M. jannaschii predicted coding region MJECL41Methanococcus jannaschii large extra-chromosomal element, complete sequence. identified by GeneMark; putative
Contig061D	13864680_c2_192	59	2896	384	128	247	4.10E-21	Bacillus subtilis	P45949	yqcYqclBacillus subtilis DNA, 283 Kb region containing skin element. similarity to arsenical resistance operon
Contig061D	13912551_c1_141	60	2897	1695	565	149	8.20E-08	Streptococcus thermophilus bacteriophage	g455528	hypothetical protein 2S. thermophilus bacteriophage viral DNA, orf1 and orf2. ORF2
Contig061D	14111687_f3_117	61	2898	225	75	104	2.80E-05	Rhizobium sp. NGR234	P55500	y41QY4iQRhizobium sp. NGR234 plasmid pNGR234a, section 16 of 46 of the complete plasmid sequence. putative insertion sequence ATP-binding protein;
Contig061D	14460882_c3_254	62	2899	435	145	676	1.40E-66	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, complete cds. ORF1
Contig061D	14532058_c3_221	63	2900	273	91	452	7.80E-43	Staphylococcus aureus	g46600	putative transposaseS. aureus plasmid pSH6 DNA for insertion sequences IS257-2, IS257-3 and IS256.
Contig061D	14578382_f1_12	64	2901	192	64					
Contig061D	14719827_c3_244	65	2902	330	110					
Contig061D	15632952_c1_145	66	2903	489	163					
Contig061D	15788276_f3_111	67	2904	198	66					



[illegible]

Contig061D	20585963_c3_248	78	2915	906	302	647	1.70E-63	Bacillus anthracis	g929972	Bacillus anthracis Weybridge A toxin plasmid pXOI1 right inverted repeat element (WeyAR) bordering the toxin-encoding region, ORFA and ORFB genes, complete cds. ORFB; similar to B. anthracis SterneL element ORFB; integraseBacteriophage TP901-1 ORF1,2 & 3. Orf1
Contig061D	20964212_c3_223	79	2916	1692	564	344	1.10E-29	Bacteriophage TP901-1	e155312	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 16/27, 1991550-2137258 ORF ID
Contig061D	2120265_c3_218	80	2917	870	290	151	5.10E-08	Synechocystis sp.	d1019159	H11285 type I restriction enzyme ECOR124/3 R proteinHaemophilus influenzae from bases 1356902 to 1368850 (section 123 of 163) of the complete genome. similar to SP
Contig061D	21521878_c1_130	81	2918	354	118	181	9.90E-13	Haemophilus influenzae	g1574743	TryDC-2 tyrosine decarboxylaseParsley tyrosine decarboxylase (TryDC-2) mRNA, complete cds. aromatic-L-amino-acid decarboxylase
Contig061D	21651677_f1_44	82	2919	255	85			Petroselinum crispum	Q06086	hypothetical protein 176 (SAGP 5' region)
Contig061D	2209675_f1_28	83	2920	1470	490	465	3.30E-44			
Contig061D	22537563_c1_149	84	2921	231	77			Streptococcus pyogenes	JH0364	
Contig061D	23437803_f3_91	85	2922	714	238	122	1.60E-06			
Contig061D	23438876_f3_116	86	2923	258	86			Bacillus subtilis	e1182558	YdhK hypothetical protein ydhKBacillus subtilis complete genome (section 4 of 21) membrane protein
Contig061D	23439193_c3_240	87	2924	495	165	453	6.10E-43			
Contig061D	23556577_f1_46	88	2925	324	108			Bacillus subtilis	g2529473	yokZYokZ Bacillus subtilis 168 region at 182 min containing the cge gene cluster. similar to the VanYB (D,D-carboxypeptidase) of
Contig061D	235678_f2_53	89	2926	216	72	203	1.90E-16			
Contig061D	23610952_c2_206	90	2927	855	285	305	2.90E-27	Archaeoglobus fulgidus	g2648798	AF1753 lysophospholipase Archaeoglobus fulgidus section 125 of 172 of the complete genome. similar to GP
Contig061D	23632883_c1_151	91	2928	183	61					



Contig061D	24430392_c1_157	108	2945	681	227	1116	3.40E-113	Plasmid p1258	P08653	merBorganomercurial lyasePlasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cds.alkylmercu
Contig061D	24432662_c2_190	109	2946	969	323	304	8.70E-48	Escherichia coli	P36649	yacKhypothetical protein in speE-gcd intergenicEscherichia coli K-12 MG1655 section 11 of 400 of the completegenome.o516; 100 pct identical to 463 residues from
Contig061D	24486008_c2_194	110	2947	978	326					
Contig061D	24641941_f3_94	111	2948	510	170					
Contig061D	24650427_f3_110	112	2949	3126	1042	1653	1.90E-220	Haemophilus influenzae	g1574743	H11285type I restriction enzyme ECOR124/3 R proteinHaemophilus influenzae from bases 1356902 to 1368850 (section 123of 163) of the complete genome.similar to SP
Contig061D	24783462_c2_173	113	2950	339	113					
Contig061D	24797126_f1_40	114	2951	249	83					
Contig061D	24812927_f2_50	115	2952	183	61					
Contig061D	254527_c2_183	116	2953	186	62					
Contig061D	25583568_f1_3	117	2954	363	121					
Contig061D	25587802_c1_134	118	2955	777	259	114	8.50E-05	Borrelia burgdorferi	g2688190	BB0276flagellar biosynthesis protein (fliZ)Borrelia burgdorferi (section 23 of 70) of the complete genome.similar to PID
Contig061D	26597010_f3_118	119	2956	186	62	103	2.40E-05	Rhizobium sp. NGR234	Q53200	y4uHY4uHRhizobium sp. NGR234 plasmid pNGR234a, section 36 of 46 of thecomplete plasmid sequence.putative insertion sequence ATP-binding protein
Contig061D	26759707_c1_143	120	2957	450	150	319	9.70E-29	Staphylococcus aureus	A60450	hypothetical protein att155 (transposon attachment site)
Contig061D	2819632_f1_48	121	2958	387	129					
Contig061D	2867812_c2_195	122	2959	213	71					
Contig061D	2946092_c2_169	123	2960	435	145					

Contig061D	30086682_c2_185	124	2961	732	244	1134	4.20E-115	Plasmid p1258	g459905	hypothetical 24K protein (mer operon)Plasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cd
Contig061D	30111718_c2_189	125	2962	2124	708	1980	6.20E-211	Enterococcus hirae	P05425	copBATPaseEnterococcus hirae ATPase (copA) gene, complete cds; ATPase (copB) gene, complete cds.Enterococcus Cu2+-transporting ATPaseputative
Contig061D	32148381_f3_112	126	2963	198	66					
Contig061D	32226577_c3_236	127	2964	354	118	596	4.30E-58	Plasmid p1258	g459904	hypothetical 18K protein (mer operon)Plasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cd
Contig061D	33261588_c2_168	128	2965	690	230					
Contig061D	33261637_c3_225	129	2966	543	181					
Contig061D	3332776_f3_129	130	2967	228	76					
Contig061D	33867212_f3_128	131	2968	339	113					
Contig061D	34016880_f2_89	132	2969	273	91	422	3.40E-39	Staphylococcus aureus	g46611	mecAPBP2AS. aureus mecA gene for PBP2' (penicillin binding protein 2').PBP2' (AA 1-668)

Contig061D	34631527_f1_8	133	2970	834	278	472	5.90E-45	Marinococcus halophilus	g2098612	putative transposaseMarinococcus halophilus L-2,4-diaminobutyric acid acetyltransferase (ectA) gene, L-2,4-diaminobutyric acid transaminase(ectB) gene, ectoine synthase (ectC) gene, putative transposaseorfA gene, complete cds, and putative transposase orf
Contig061D	35157813_f2_54	134	2971	519	173	473	4.60E-45	Escherichia coli	P37354	speGSpermidine N1-acetyltransferase (EC 2.3.1.57)E.coli genomic DNA, Kohara clone #308(35.3-35.7 min.).ORF_ID
Contig061D	35334686_f2_87	135	2972	1713	571	1253	1.00E-127	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds.ORF1
Contig061D	36135952_f2_85	136	2973	1650	550	463	5.30E-44	Bacteriophage TP901-1	e155312	integraseBacteriophage TP901-1 ORF1,2 & 3.orf1
Contig061D	36211052_c1_156	137	2974	1662	554	2755	7.00E-287	Plasmid p1258	P08663	merAmercure reductasePlasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cds.dihydroliipoam
Contig061D	36225427_f2_83	138	2975	615	205					
Contig061D	36226501_c2_175	139	2976	891	297					
Contig061D	36584652_c1_132	140	2977	339	113	300	1.00E-26	Bacillus anthracis	g929968	Bacillus anthracis Sterne toxin plasmid pXOI1 right inverted repeatelment (SterneR) bordering the toxin-encoding region, ORFA andtruncated ORFB genes, complete cds.ORFA; similar to B. anthracis WeyAR element ORFA;
Contig061D	3913137_f2_62	141	2978	570	190	982	5.40E-99	Plasmid p1258	g459909	Plasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cds.ORF1

Contig061D	3938802_f2_84	142	2979	1383	461	238	2.50E-17	Bacteriophage TP901-1	e155312	integraseBacteriophage TP901-1 ORF1,2 & 3.Orf1
Contig061D	4022952_f1_29	143	2980	1515	505	1186	3.30E-140	Mycobacterium tuberculosis	e1173886	hsdMDNA methylaseMycobacterium tuberculosis sequence v002.MTV002.21c, hsdM, type 1 restriction/modification
Contig061D	4025302_f3_97	144	2981	1293	431	1892	2.00E-195	Plasmid p1258	P30329	arsBArsonic efflux pump proteinPlasmid p1258 arsenic resistance operon (arsRBC) genes, completecds.arsenical pump membrane protein
Contig061D	4098518_c2_184	145	2982	417	139	682	3.30E-67	Plasmid p1258	P22874	MERRhypothetical 16K protein (mer operon)Plasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercuriallyase (merB), regulatory protein (merR) and membrane transportprotein (merT), complet
Contig061D	4120462_f2_52	146	2983	945	315	791	9.30E-79	Escherichia coli	Q46807	YQEAhypothetical protein b2874Escherichia coli K-12 MG1655 section 260 of 400 of the completegenome.carbamate kinaseo310; This 310 aa ORF is 45 pct identical (21 gaps)
Contig061D	4196051_f1_14	147	2984	333	111	424	7.20E-40	Staphylococcus xylosus	A41902	arsKArsonic resistance operon repressorarsenical resistance operon repressor
Contig061D	4453165_c1_160	148	2985	537	179	202	1.50E-15	Escherichia coli	d1006123	'ORF'Escherichia coli genome, 2.4-4.1 min region (110,917-193,643 bpfrom 0 min). 'copper resistance protein copA homology'
Contig061D	4485937_f1_2	149	2986	1044	348	1060	2.90E-107	Haemophilus influenzae	P44770	H1059Oornithine carbamoyltransferase (arcB)Haemophilus influenzae from bases 614291 to 624841 (section 56 of163) of the complete genome.ornithine carbamoyltransferasesimilar to GB

Contig061D	448785_f3_114	150	2987	927	309	408	3.60E-38	Arthrobacter sp.	Q44311	soxRnegative regulatorArthrobacter sp. gene for negative regulator, sarcosine oxidase, transporter, creatinase, creatinase and transporter, complete cds.
Contig061D	4694677_c1_144	151	2988	324	108					
Contig061D	4697337_f3_115	152	2989	549	183	255	5.90E-22	Bacillus subtilis	g1934639	yrpB2-nitropropane dioxygenaseBacillus subtilis alcohol dehydrogenase (adhB) gene, partial cds,hypothetical spore coat protein (yraf), hypothetical spore coatprotein (yrag), YraH (yrah), YraI (yral), YraJ (yraj), YraK (yrak), YraL (yral), chitosanase precu
Contig061D	4722338_c3_224	153	2990	234	78					
Contig061D	4726555_f2_51	154	2991	474	158	183	2.50E-14	Bacillus subtilis	P17893	ahrCAhrCB.subtilis ahrC gene, encoding an arginine repressor/activatorprotein.ahrC protein
Contig061D	4866425_f2_82	155	2992	465	155	305	2.90E-27	Bacillus subtilis	g1934639	yrpB2-nitropropane dioxygenaseBacillus subtilis alcohol dehydrogenase (adhB) gene, partial cds,hypothetical spore coat protein (yraf), hypothetical spore coatprotein (yrag), YraH (yrah), YraI (yral), YraJ (yraj), YraK (yrak), YraL (yral), chitosanase precu
Contig061D	4867343_c3_215	156	2993	2739	913	234	5.10E-16	Borrelia burgdorferi	g2688552	BB0632exodeoxyribonuclease V, alpha chain (recD)Borrelia burgdorferi (section 50 of 70) of the complete genome.similar to SP
Contig061D	492086_f3_124	157	2994	1824	608					
Contig061D	4971051_c2_178	158	2995	825	275	181	1.10E-13	Lactococcus lactis cremoris	g1405404	abiGiAbiGiLactococcus lactis cremoris abortive infection proteins (abiGi andabiGii) genes, complete cds.
Contig061D	5133462_f3_122	159	2996	1530	510	119	1.60E-05	Saccharomyces cerevisiae	P47037	SCP160hypothetical proteinS.cerevisiae DNA for hypothetical proteins and esterase genes. ORF YJL074c
Contig061D	5292300_c2_167	160	2997	342	114					
Contig061D	649141_f2_86	161	2998	567	189					
Contig061D	6521882_f1_16	162	2999	195	65					



Contig061D	6643751_c1_158	163	3000	270	90	1230	2.80E-125	Clostridium perfringens	e242289	arcD arginine ornithine antiporterC.perfringens strain 13 arcABDC, ahrC and colA genes.
Contig061D	6819462_f1_1	164	3001	1491	497					
Contig061D	6834501_c1_142	165	3002	231	77					
Contig061D	6929627_c2_197	166	3003	1146	382	756	4.80E-75	Mycobacterium tuberculosis	e322878	MTC128.02calcohol dehydrogenaseMycobacterium tuberculosis cosmid 128.MTC128.02c, alcohol dehydrogenase, len
Contig061D	6929642_f1_4	167	3004	243	81					
Contig061D	6929686_c2_205	168	3005	264	88	368	6.20E-34	Staphylococcus aureus	g46597	transposaseS.aureus plasmid pSH6 DNA for insertion sequences IS257-1 andIS256.
Contig061D	862927_c3_251	169	3006	195	65					
Contig061D	892142_f2_55	170	3007	198	66					
Contig061D	917550_c1_163	171	3008	216	72	143	4.30E-10	Bacillus anthracis	g929968	Bacillus anthracis Sterne toxin plasmid pXOI right inverted repeat element (SterneR) bordering the toxin-encoding region, ORFA and truncated ORFB genes, complete cds. ORFA; similar to B. anthracis WeyAR element ORFA;
Contig061D	970250_c2_193	172	3009	912	304	446	3.40E-42	Methanobacteri um thermoautotrop hicum	g2621989	MTH894conserved proteinMethanobacterium thermoautotrophicum from bases 808939 to 820180(section 71 of 148) of the complete genome.Function Code
Contig061D	970386_f1_27	173	3010	333	111	270	4.30E-23	Bacillus subtilis	e1184706	yxxCmetabolite transport protein homolog yxxCBacillus subtilis complete genome (section 21 of 21)similar to metabolite transport protein
Contig061D	979178_c3_246	174	3011	243	81					
Contig061D	9806332_f3_109	175	3012	450	150	237	7.70E-20	Pyrococcus horikoshii	d1027703	PHAB011376aa long hypothetical dehydrogenasePyrococcus horikoshii OT3 genomic DNA, 512441-547109 nt position(complementary strand), clonecontains ATP/GTP-binding site motif A (P-loop) ;

Contig061D	9806692_c3_235	176	3013	1374	458	907	4.70E-91	Plasmid p1258	P08655	merRegulatory proteinPlasmid p1258 (from S.aureus strain RN23 8325) mercury resistance(mer) operon encoding mercuric reductase (merA), organomercurialylase (merB), regulatory protein (merR) and membrane transportprotein (merT), complete cds.
Contig140D	1385927_f3_8	177	3014	369	123					
Contig140D	14882135_f2_4	178	3015	2112	704	167	1.30E-09	Escherichia coli	P10411	merRmelibiose operon regulatory proteinEscherichia coli K-12 MG1655 section 374 of 400 of the completegenome.arabinose operon regulatory proteinf302; CG Site No. 18166
Contig140D	24110652_c2_10	179	3016	822	274	879	4.40E-88	Bacillus cereus	cl1179988	gluTproton /sodium-glutamate symport proteinB.cereus partial gluT, aspA and partial maoX genes.
Contig140D	25634627_f2_5	180	3017	468	156	290	1.10E-25	Bacillus subtilis	P80238	ydaGgeneral stress protein homolog ydaGBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.FUNCTION UNKNOWN.
Contig140D	29352342_c3_12	181	3018	531	177	371	3.00E-34	Bacillus stearothermophilus	P24943	gluTproton glutamate symport proteinBacillus stearothermophilus proton glutamate symport protein (gluT)gene, complete cds.
Contig140D	32242200_f1_1	182	3019	378	126					
Contig149D	22042187_c2_15	183	3020	1401	467	1065	8.60E-108	Klebsiella pneumoniae	g2735583	rbtTribitol transporterKlebsiella pneumoniae ribitol kinase (rbtK) and ribitol transporter(rbtT) genes, complete cds.RbtT
Contig149D	22947833_c1_12	184	3021	192	64					
Contig149D	31877334_c2_14	185	3022	521	174	432	1.00E-40	Azorhizobium caulinodans	g763062	AraC-like proteinA.caulinodans nodD gene.gtg start codon; homologous to AraC family of
Contig149D	6938816_c3_17	186	3023	453	151					
Contig150D	24645942_c1_12	187	3024	444	148	384	1.30E-35	Haemophilus influenzae	P44814	H10670hypotheticalHaemophilus influenzae from bases 712950 to 723016 (section 65 of163) of the complete genome.similar to GB

	Contig150D	24713531_f2_5	188	3025	228	76					Xanthomonas campestris	d1012290	aminopeptidaseXanthomonas campestris DNA for aminopeptidase, complete cds.
	Contig150D	26377250_c2_14	189	3026	711	237	643	4.50E-63			Pseudomonas putida	g2642342	pipI proline iminopeptidasePseudomonas putida inducible histidine transporter (hutT),imidazolone propionate hydrolase (hutL), and N-formylglutamateamidohydrolase (hutG) genes, complete cds; and prolineiminopeptidase (pipI) gene, partial cds.
	Contig150D	29423955_c1_11	190	3027	183	61	90	5.20E-06			Bacillus subtilis	e1184072	tigt trigger factor (prolyl isomerase)Bacillus subtilis complete genome (section 15 of 21) alternate gene name
	Contig150D	3179561_f1_2	191	3028	225	75					Escherichia coli	d1015377	mdoGMdoG proteinEscherichia coli genomic DNA. (23.6 - 23.9 min).
	Contig150D	32697905_c3_16	192	3029	207	69					Bacillus stearothermophilus	A26738	valS valine--tRNA ligase, valine-tRNA ligase
	Contig150D	35207326_c1_13	193	3030	1191	397	1384	1.30E-141			Bacillus subtilis	e1184072	tigt trigger factor (prolyl isomerase)Bacillus subtilis complete genome (section 15 of 21)
	Contig150D	35408180_f2_8	194	3031	261	87					Bacillus subtilis	P50866	cnpC cAMP-dependent phosphodiesterase
	Contig157D	10008513_c1_34	195	3032	2667	889	3361	0			Bacillus subtilis	g142856	mreCMreC proteinBacillus subtilis orfA, orfB, mreB, mreC, mreD, minC, and minDgenes, complete coding regions.
	Contig157D	10720877_c2_39	196	3033	1329	443	1343	3.00E-137			Bacillus subtilis	P55873	rplTribosomal protein L20Bacillus subtilis complete genome (section 15 of 21) homology to rplT of Bacillus stearothermophilus;
	Contig157D	1211562_c3_48	197	3034	1269	423	1518	8.50E-156			Bacillus subtilis	g2589181	hemCPorphobilinogen deaminaseStaphylococcus aureus hemCDBL gene cluster
	Contig157D	188388_c1_38	198	3035	333	111	110	5.70E-06			Bacillus subtilis		
	Contig157D	19707767_f3_22	199	3036	324	108							
	Contig157D	20348160_f3_20	200	3037	222	74							
	Contig157D	23522567_c3_46	201	3038	381	127	450	1.30E-42			Bacillus subtilis		
	Contig157D	23697141_c3_50	202	3039	930	310	1327	1.50E-135			Staphylococcus aureus		
	Contig157D	24240877_c1_36	203	3040	522	174							

Contig	57D	4080443_c1_32	214	3051	1296	432	2041	3.20E-211	Staphylococcus aureus	hemLGSa-1-g2589184	hemCDBL gene cluster
									aminotransferase	Staphylococcus aureus	

Contig157D	439183_f3_24	215	3052	297	99	208	5.60E-17	Bacillus subtilis	e1165375	yscChypothetical proteinB.subtilis genomic sequence 89009bp.unknown function; putative
Contig157D	500052_c1_35	216	3053	669	223	440	1.50E-41	Bacillus subtilis	Q02170	orfBDNA repair protein homolog yscABacillus subtilis orfA, orfB, mreB, mreC, mreD, minC, and minDgenes, complete coding regions.homologous to E.coli radC gene product and to
Contig157D	5268775_c1_28	217	3054	960	320	138	7.10E-07	Bacillus subtilis	e1184073	yscAhypothetical proteinBacillus subtilis complete genome (section 15 of 21)unknown function; putative
Contig157D	5860827_c1_29	218	3055	1347	449	1172	3.90E-119	Bacillus subtilis	P16618	hemANAD(P)HBacillus subtilis hemAXCDBL gene cluster:glutamy-l-rRNA reductaseThe product of this hemA gene is not an
Contig157D	6845382_f1_1	219	3056	219	73					
Contig157D	806510_c2_44	220	3057	714	238	189	5.80E-15	Bacillus subtilis	P15378	comClate competence proteinBacillus subtilis late competence protein (comC) gene, completecds.
Contig157D	820253_f3_25	221	3058	297	99	206	9.10E-17	Bacillus subtilis	e1165375	yscChypothetical proteinB.subtilis genomic sequence 89009bp.unknown function; putative
Contig157D	978562_c2_40	222	3059	861	287	1261	1.50E-128	Staphylococcus aureus	P50915	hemBd-aminolevulinic acid dehydrataseStaphylococcus aureus hemCDBL gene cluster
Contig200D	14900826_f3_4	223	3060	351	117	188	7.40E-15	artificial sequence	g208931	Synthetic E.coli ORF16/lacZ fusion protein, partial cds. ORF16-lacZ fusion protein
Contig219D	2214217_f1_2	224	3061	1845	615	1438	2.60E-147	Bacillus subtilis	d1011961	ycyCtwo-component sensor histidine kinase [Yyc homolog yycGBacillus subtilis 36kb sequence between gntZ and trnY genesencoding 34 ORFs.homologous to sp
Contig219D	24848452_f2_7	225	3062	792	264	223	1.40E-18	Bacillus subtilis	d1011959	yycChypothetical protein yycIBacillus subtilis 36kb sequence between gntZ and trnY genesencoding 34 ORFs.
Contig219D	33337760_f1_1	226	3063	705	235	954	5.00E-96	Bacillus subtilis	P37478	yycFunknownB. subtilis DNA, 180 kilobase region of replication origin.ompr proteinhomologous to sp

Contig219D	34417813_f1_3	227	3064	807	269	851	4.10E-85	Bacillus subtilis	d1011958	yycJhypothetical protein yycJBacillus subtilis 36kb sequence between gntZ and tmY genes encoding 34 ORFs.
Contig219D	4093937_f2_4	228	3065	192	64					
Contig219D	7223587_f2_6	229	3066	1401	467	218	4.10E-15	Bacillus subtilis	d1011960	yycHBacillus subtilis 36kb sequence between gntZ and tmY genes encoding 34 ORFs.
Contig241D	30569025_c3_20	230	3067	2541	847	290	1.40E-21	Caenorhabditis elegans	g1166621	F35A5.1Caenorhabditis elegans cosmid F35A5.
Contig241D	36042152_c3_21	231	3068	1152	384	202	1.90E-13	Trypanosoma brucei	g530361	12 proteinT.brucei 12 mRNA for flagellar antigen.
Contig241D	36042152_c3_22	232	3069	408	136	102	9.60E-06	STAPHYLOCOCCUS AUREUS	P80544	METHICILLIN-RESISTANT SURFACE PROTEIN (FRAGMENTS)
Contig255D	12142768_c1_7	233	3070	300	100	110	3.50E-06	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position,clone
Contig255D	12603166_c3_17	234	3071	303	101	100	1.60E-05	Pyrococcus horikoshii	d1027339	PHBW012106aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position,clone
Contig255D	14849093_f3_5	235	3072	294	98	127	2.10E-08	Mitochondrion Chondrus crispus	e138028	putative orf79.1C.crispus complete mitochondrial genome.unique orf
Contig255D	14900826_f2_2	236	3073	351	117	188	7.40E-15	artificial sequence	g208931	Synthetic E.coli ORF16/lacZ fusion protein, partial cds. ORF16-lacZ fusion protein
Contig255D	2379658_c2_10	237	3074	225	75					
Contig255D	285808_c2_12	238	3075	225	75					
Contig255D	3361326_f2_3	239	3076	207	69					
Contig276D	14147177_c2_3	240	3077	366	122					
Contig276D	23725442_c1_2	241	3078	411	137					
Contig278D	194202_f3_8	242	3079	255	85					
Contig278D	20587536_c2_13	243	3080	630	210	241	1.80E-20	Bacillus subtilis	P37467	xpaChydrolysis of 5-bromo-4-chloroindolyl phosphateB. subtilis DNA, 180 kilobase region of replication origin.
Contig278D	24615915_f2_5	244	3081	240	80	275	4.40E-24	Staphylococcus aureus	g2226349	espCCspCStaphylococcus aureus CspC (cspC) gene, complete cds.similar to major cold-shock protein

Contig278D	25423425_c3_16	245	3082	210	70							
Contig278D	25428378_c3_15	246	3083	228	76							
Contig278D	33470001_f2_4	247	3084	336	112	137	1.90E-09	Streptococcus gordonii	g2058543	putative DNA binding protein Streptococcus gordonii RNA polymerase beta' subunit (rpoC), putative DNA binding protein, putative ABC transporter subunit ComYA (comYA), putative ABC transporter subunit ComYB (comYB) and ComYC gene, complete cds, and ComYD gene,		
Contig278D	35159452_f2_3	248	3085	1302	434	1371	3.20E-140	Staphylococcus aureus	g2315995	branched-chain amino acid carrier protein Staphylococcus aureus branched-chain amino acid carrier proteingene, complete cds.branched-chain amino acid transporter		
Contig278D	4718760_f3_9	249	3086	327	109							
Contig278D	4796875_c2_12	250	3087	315	105	146	2.10E-10	Archaeoglobus fulgidus	g2649785	AF0818acylphosphatase (acyP)/Archaeoglobus fulgidus section 60 of 172 of the complete genome.similar to SP		
Contig278D	6442787_c3_17	251	3088	1179	393	923	9.60E-93	Bacillus subtilis	P37535	yaaNunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to toxic cation resistance		
Contig282D	10563141_f1_4	252	3089	345	115							
Contig282D	1214635_c2_43	253	3090	387	129	202	2.40E-16	Bacillus subtilis	Q08429	kapBkinase-associated protein BBacillus subtilis putative aminotransferase (patB), ATP-dependentprotein kinase B (kinB), kinase-associated protein B (kapB) andKapD (kapD) genes, complete cds.second and last ORF of the kinB-kapB operon;		
Contig282D	14460932_f2_13	254	3091	294	98	451	1.00E-42	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completcds.ORF1		

Contig282D	14484553_f2_16	255	3092	1356	452	1726	7.70E-178	Bacillus stearothermophilus	P13375	PGIA glucose-6-phosphate isomerase, ABacillus stearothermophilus pgIA gene for phosphoglucose isomerase (EC 5.3.1.9), glucose-6-phosphate isomerase phosphoglucose isomerase A (AA 1-449)
Contig282D	15041078_f2_9	256	3093	279	93	319	9.70E-29	Bacillus subtilis	e1184283	yuiF conserved hypothetical protein yuiF Bacillus subtilis complete genome (section 17 of 21) similar to hypothetical proteins
Contig282D	21571937_c3_48	257	3094	213	71					
Contig282D	21646015_f3_24	258	3095	201	67	198	6.40E-16	Staphylococcus haemolyticus	g1022725	unknown Staphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, complete cds. ORF2
Contig282D	22136087_c2_45	259	3096	1512	504	1214	1.40E-123	Bacillus subtilis	e1184241	yufDNADH dehydrogenase (ubiquinone) homolog yufDBacillus subtilis complete genome (section 17 of 21) similar to NADH dehydrogenase (ubiquinone)
Contig282D	22462787_f1_8	260	3097	261	87	257	3.60E-22	Staphylococcus aureus	g1595809	spsA type-I signal peptidase SpsA Staphylococcus aureus type-I signal peptidase SpsA (spsA) gene, and type-I signal peptidase SpsB (spsB) gene, complete cds. inactive signal peptidase homologue; protein lacks
Contig282D	23445958_f1_3	261	3098	243	81					
Contig282D	23535910_f1_7	262	3099	603	201	358	7.10E-33	Bacillus subtilis	e1183050	yhiE hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hypothetical proteins from B. subtilis
Contig282D	23859843_f1_5	263	3100	393	131	212	2.10E-17	Bacillus subtilis	e1184217	yugL unknown Bacillus subtilis complete genome (section 17 of 21) similar to polyribonucleotide
Contig282D	23947132_f3_17	264	3101	378	126	269	1.90E-23	Bacillus licheniformis	e291128	ComAB. licheniformis comAB gene.
Contig282D	24644702_c1_33	265	3102	435	145	307	1.80E-27	Bacillus subtilis	e1184239	yufU unknown Bacillus subtilis complete genome (section 17 of 21) similar to Na+/H+ antiporter



Contig282D	24745437_f3_26	266	3103	1263	421	1659	9.70E-171	Bacillus subtilis	P50735	ypcA glutamate dehydrogenase subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sleB), ypeB, ypfA, ypfB, cytid
Contig282D	26178400_f3_28	267	3104	186	62					
Contig282D	26756252_c3_54	268	3105	2427	809	2158	1.30E-223	Bacillus subtilis	e1184238	yufT unknown Bacillus subtilis complete genome (section 17 of 21) similar to NADH dehydrogenase
Contig282D	29742890_f2_14	269	3106	189	63					
Contig282D	31281253_f3_25	270	3107	1221	407	1513	2.90E-155	Bacillus subtilis	P38021	rocD orthine aminotransferase Bacillus subtilis 36kb sequence between gntZ and tnY genes encoding 34 ORFs.
Contig282D	32689812_c2_46	271	3108	312	104	224	1.10E-18	Bacillus subtilis	e1184242	yufT unknown Bacillus subtilis complete genome (section 17 of 21)
Contig282D	33397338_c3_55	272	3109	492	164	167	1.20E-12	Pyrococcus horikoshii	d1028563	PHCC005174aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 1300517-1338254 nt position, clone
Contig282D	34384380_c1_34	273	3110	333	111	278	2.10E-24	Bacillus subtilis	e1184240	yufT unknown Bacillus subtilis complete genome (section 17 of 21) similar to Na+/H+ antiporter
Contig282D	34617286_f2_12	274	3111	612	204	336	8.30E-40	Homo sapiens	d1008136	KIAA0073 Human mRNA for KIAA0073 gene, partial cds. The ha1539 protein is related to cyclophilin.
Contig282D	36604587_c1_35	275	3112	1173	391					
Contig282D	3985893_c3_53	276	3113	186	62					
Contig282D	4100393_c3_47	277	3114	1215	405	1458	1.90E-149	Bacillus subtilis	g2293242	argG arginine succinate synthase Bacillus subtilis rmB-dnaB genomic region.
Contig282D	48587_c3_49	278	3115	1062	354	729	3.50E-72	Bacillus subtilis	P37965	glpQ glycerophosphoryl diester phosphodiesteraseB. subtilis glpT and glpQ genes for glycerol 3-phosphate permease and glycerophosphoryl diester phosphodiesterase.alternate gene name

Contig282D	5085003_c1_32	279	3116	1455	485	1439	2.00E-147	Bacillus subtilis	g2293243	argHarginine succinate lyaseBacillus subtilis rruB-dnaB genomic region.
Contig282D	5114680_c3_56	280	3117	363	121	227	5.40E-19	Bacillus subtilis	e1184243	yufBunkownBacillus subtilis complete genome (section 17 of 21) similar to hypothetical proteins
Contig282D	6672886_f3_23	281	3118	1173	391	914	8.60E-92	Bacillus subtilis	P54524	yqjGYqjGBacillus subtilis DNA, 283 Kb region containing skin element.similar to NADH-dependent flavin oxidoreductase
Contig282D	783125_c3_52	282	3119	183	61					
Contig296D	10031712_f2_69	283	3120	990	330	597	3.40E-58	Bacillus subtilis	P54538	yqjAYqjABacillus subtilis DNA, 283 Kb region containing skin element.
Contig296D	10312561_f1_26	284	3121	1236	412	996	1.80E-100	Bacillus subtilis	P38494	ypfDunkownBacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sieB), ypeB, ypfA, ypfB, cytidine monophosphate
Contig296D	10334752_c3_311	285	3122	192	64					
Contig296D	10642180_f3_143	286	3123	186	62					
Contig296D	1070437_f1_37	287	3124	894	298	727	5.60E-72	Bacillus subtilis	P54161	ypcPexodeoxyribonucleaseBacillus subtilis (YAC10-9 clone) DNA region between the serA and kdg loci.36.1% identity with 219 aa at the 5' end of the
Contig296D	1229750_f1_8	288	3125	468	156	504	2.40E-48	Bacillus stearothermophilus	e290687	argRarginine repressorB.stearothermophilus argR gene.
Contig296D	1345752_c1_194	289	3126	945	315	720	3.10E-71	Bacillus subtilis	P54569	yqkFYqkFBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig296D	13853500_c2_221	290	3127	246	82					
Contig296D	13876943_f1_46	291	3128	1488	496	882	2.10E-88	Bacillus subtilis	g2529476	orfRM1OrfRM1Bacillus subtilis 168 region at 182 min containing the cge genecluster similar to the E. coli Prc and carboxyl-terminal

Contig296D	14097011_fl_1	292	3129	612	204	522	3.00E-50	Bacillus stearothermophilus	Q07908	argJ, ornithine acetyltransferase, Bacillus stearothermophilus ornithine acetyltransferase (argJ) and acetylglutamate kinase (argB) genes, complete cds's, argC gene, 3' end, and argD gene, 5' end. also bears acetyl-CoA
Contig296D	16610088_fl_21	293	3130	393	131	217	6.20E-18	Bacillus subtilis	P50726	ypaA, hypothetical protein ypaA, Bacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (steB), ypeB, ypfA, ypfB, cyti
Contig296D	16923383_fl_15	294	3131	339	113	156	2.60E-11	Bacillus subtilis	P54554	yqjY, yqjQ, Bacillus subtilis DNA, 283 Kb region containing skin element, similar to ketoacyl reductase
Contig296D	17002217_fl_16	295	3132	465	155	587	3.90E-57	Bacillus subtilis	P54574	yqkL, YqkL, Bacillus subtilis DNA, 283 Kb region containing skin element, similar to transcriptional regulator (Fur family)
Contig296D	187593_f2_77	296	3133	972	324	177	3.20E-12	Bacillus subtilis	P50728	ypbB, hypothetical protein ypbB, Bacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (steB), ypeB, ypfA, ypfB, cyti
Contig296D	19567588_f3_136	297	3134	513	171	443	7.00E-42	Bacillus stearothermophilus	P42015	ptsG, PTS glucose-specific permease, Bacillus stearothermophilus XL-65-6 phosphoenolpyruvate-dependent phosphotransferase system glucose-specific permease (ptsG') gene, partial cds, HPr (ptsH), enzyme I (ptsI), and PtsT (ptsT) genes, complete cds, and wall asso

Contig296D	19567812_f3_135	298	3135	465	155	478	1.40E-45	Bacillus subtilis	P54155	ypqTranscriptional regulator (PilB family) homolog yppQBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.54.8% identity with Neisseria gonorrhoeae
Contig296D	19804838_c2_224	299	3136	717	239	549	4.10E-53	Bacillus subtilis	P54163	ypdPConserved hypothetical protein yppQBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.putative
Contig296D	20035967_f2_78	300	3137	1059	353	920	2.00E-92	Bacillus subtilis	g1146220	glyCNAD+ dependent glycerol-3-phosphateBacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortexlytic enzyme (steB), ypeB, ypfA,
Contig296D	20485712_f3_137	301	3138	573	191					
Contig296D	20507937_f3_124	302	3139	1317	439	1823	4.10E-188	Bacillus subtilis	P39772	asnSasparaginyI-tRNA synthetaseBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes,ypjABCDEFH genes, birA gene, panBCD genes, dinG gene, ypmB gene,aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.41.1% of identity to the
Contig296D	20517135_f1_27	303	3140	315	105	361	3.40E-33	Bacillus stearothermophilus	P02346	hubstDNA binding protein HUBBacillus stearothermophilus gene for DNA binding protein HU,complete cds.bacterial DNA-binding protein
Contig296D	20594688_f2_100	304	3141	1725	575	126	5.10E-08	Bacillus subtilis	P37966	lplAlysis proteinBacillus subtilis lysis protein (lplA) gene, complete cds.
Contig296D	20734677_f1_53	305	3142	774	258	277	2.70E-24	Escherichia coli	g1789829	glpRrepressor proteinEscherichia coli K-12 MG1655 section 308 of 400 of the completegenome.f252; CG Site No. 688

Contig296D	2148387_f2_82	306	3143	1278	426	1794	4.80E-185	Staphylococcus aureus	Q59803	aroC aureus chorismate synthase (aroC) and nucleosidediphosphate kinase (ndk) genes, complete cds, dehydroauinatesynthase (aroB) and geranylgeranyl pyrophosphate synthetase homolog(gerCC) genes, partial cds.5-enopyruvylsh
Contig296D	21501550_f1_48	307	3144	1116	372	917	4.10E-92	Bacillus subtilis	e1186380	msmX multiple sugar-binding transport ATP-bindingBacillus subtilis complete genome (section 20 of 21)alternate gene name
Contig296D	21537962_f2_86	308	3145	612	204	357	9.10E-33	Bacillus subtilis	P54392	ypjA hypothetical protein ypiABacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes,ypjABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene,aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's putative
Contig296D	21674067_c1_151	309	3146	198	66					
Contig296D	21678187_f3_131	310	3147	240	80					
Contig296D	21730443_f2_67	311	3148	1332	444	904	9.90E-91	Bacillus subtilis	P37942	bfmB branched chain alpha-keto acid dehydrogenase E2Bacillus subtilis branched chain alpha-keto acid dehydrogenaseE1-alpha, branched chain alpha-keto acid dehydrogenase E1-beta, and branched chain alpha-keto acid dehydrogenase E2, complete cds.dihydrolipoa
Contig296D	21756562_f3_127	312	3149	696	232	162	4.20E-12	Bacillus subtilis	e1182974	yjeG hypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to calcium-binding protein
Contig296D	21914067_f3_142	313	3150	1416	472	532	2.60E-51	Lactococcus lactis cremoris	g2182835	IlkInA histidine kinase LkInALactococcus lactis subsp. cremoris MG1363 histidine kinase (IlkInA)gene, complete cds.

Contig296D	21962762_f1_56	314	3151	732	244	615	4.20E-60	Bacillus subtilis g143267	B. subtilis 2-oxoglutarate dehydrogenase (odhA) gene 3' end, and dihydroliipoamide transsuccinylase (odhB) gene, complete cds. 2-oxoglutarate dehydrogenase (odhA; EC 1.2.4.2)
Contig296D	23445266_f1_45	315	3152	567	189	579	2.70E-56	Bacillus subtilis P54154	yppPDNA-binding protein Bacillus subtilis (YAC10-9 clone) DNA region between the serA and kgd loci. 42.4% identity with the Lycopersicon esculentum
Contig296D	23625000_f3_110	316	3153	1683	561	2374	1.70E-246	Staphylococcus xylosus g474177	malA alpha-D-1,4-glucosidase S. xylosus malR gene and malA gene. alpha-amylose core homology
Contig296D	23707890_f2_95	317	3154	240	80	123	5.70E-08	Bacillus subtilis e1185439	yozeHypothetical protein yozE Bacillus subtilis complete genome (section 11 of 21)
Contig296D	23836052_c1_195	318	3155	849	283	392	1.80E-36	Bacillus subtilis P54552	yqjOYqjO Bacillus subtilis DNA, 283 Kb region containing skin element. similar to pyrroline-5-carboxylate reductase
Contig296D	23884692_f1_5	319	3156	366	122	217	6.20E-18	Bacillus subtilis P54519	yqhY YqhY Bacillus subtilis DNA, 283 Kb region containing skin element. similar to hypothetical proteins from B. subtilis
Contig296D	23964011_c2_214	320	3157	195	65				
Contig296D	24100715_f1_11	321	3158	1035	345	888	4.90E-89	Bacillus subtilis P37940	bfmBA A branched chain alpha-keto acid dehydrogenase Bacillus subtilis branched chain alpha-keto acid dehydrogenase E1-alpha, branched chain alpha-keto acid dehydrogenase E1-beta, and branched chain alpha-keto acid dehydrogenase E2, complete cds. pyruvate dehyd
Contig296D	24104702_f2_93	322	3159	30549	10183	618	8.80E-55	Plasmodium yoelii g1041785	rhoptyr protein Plasmodium yoelii rhoptyr protein gene, partial cds.
Contig296D	24226412_f2_73	323	3160	570	190	437	3.00E-41	Bacillus subtilis P54570	yqkGYqkGBacillus subtilis DNA, 283 Kb region containing skin element. similar to hypothetical proteins

Contig296D	24229515_f1_12	324	3161	1170	390	980	8.70E-99	Bacillus subtilis	P54542	yojEYqjEBacillus subtilis DNA, 283 Kb region containing skin element.similar to tripeptidase
Contig296D	24261692_f3_148	325	3162	1902	634	995	2.20E-100	Bacillus subtilis	g3169331	yojOYojOBacillus subtilis YojA (yojA), YojB (yojB), YojC (yojC), YojD(yojD), YojE (yojE), YojF (yojF), YojG (yojG), YojH (yojH), YojI(yojI), YojJ (yojJ), YojK (yojK), YojL (yojL), YojM (yojM), YojN(yojN), and YojO (yojO) genes, complete cds; and OdhA (odh
Contig296D	24274192_c2_225	326	3163	417	139	204	1.50E-16	Enterococcus faecalis	P36921	ebsBcell wall enzymeEnterococcus faecalis pore forming, cell wall enzyme, regulatory,and dehydroquinase homologue proteins (ebsA,ebsB,ebsC,and ebsD)genes, complete cds with repeat region.putative
Contig296D	24410300_f2_74	327	3164	759	253	686	1.20E-67	Bacillus subtilis	P35159	ypuLconserved hypothetical protein ypuL.Bacillus subtilis spoVA to serA region.ORFX13
Contig296D	24480275_f3_138	328	3165	990	330	602	9.90E-59	Bacillus subtilis	el182690	lplBtransmembrane lipoproteinBacillus subtilis complete genome (section 4 of 21)
Contig296D	24511676_f1_57	329	3166	246	82	251	3.50E-21	Bacillus subtilis	P16263	odhB2-oxoglutarate dehydrogenase complexB.subtilis 2-oxoglutarate dehydrogenase (odhA) gene 3' end, anddihydrolipoamide transsuccinylase (odhB) gene, complete cds.dihydrolipoamide acetyltransferasedihydrolipoamide transsuccinylase (odhB; EC
Contig296D	24650016_f1_34	330	3167	417	139	155	2.30E-11	Bacillus subtilis	P50839	ypsBhypothetical protein ypsBBacillus subtilis (clone YAC15-6B) ponA gene, yppBCDEFG genes,ypqAE genes, yprAB genes, cotD gene, ypsABC genes, rnaP gene, yptAgene, ypuA gene, kduDI genes, kdgRKAT genes, ypwA gene, completecds's.putative

Contig296D	24650252_c2_235	331	3168	633	211	549	4.10E-53	Bacillus subtilis	P39792	ypxBunknBacillus subtilis (clone YAC15-6B) ponA gene, yppBCDEFG genes, ypqAE genes, yprAB genes, cotD gene, ypsABC genes, rnaP gene, yptA gene, ypuA gene, kduDI genes, kdgRKAT genes, ypwA gene, completed cds's. 50.3% of identity to the 23.1 kD protein from
Contig296D	24797827_f3_144	332	3169	1857	619	1242	1.50E-126	Bacillus subtilis	P23129	odhAoxoglutarate dehydrogenase (NADP+)B. subtilis odhA gene for 2-oxoglutarate dehydrogenase.alternate gene name
Contig296D	24800461_f1_55	333	3170	231	77	235	1.40E-18	Bacillus subtilis	P23129	odhAoxoglutarate dehydrogenase (NADP+)B. subtilis odhA gene for 2-oxoglutarate dehydrogenase.alternate gene name
Contig296D	24807790_f2_63	334	3171	909	303	687	9.80E-68	Bacillus stearothermophilus	Q08291	farnesyl diphosphate synthaseB. stearothermophilus DNA for farnesyl diphosphate synthase, complete cds.
Contig296D	25598818_f1_9	335	3172	1692	564	1195	1.40E-121	Bacillus subtilis	P17894	recNRecNBacillus subtilis DNA, 283 Kb region containing skin element.recN protein recombination protein (ftg start codon)
Contig296D	25652217_f1_32	336	3173	348	116					
Contig296D	26058467_f2_72	337	3174	213	71	119	7.60E-07	Caenorhabditis elegans	g861340	E04F6.7Caenorhabditis elegans cosmid E04F6.similar to ribitol dehydrogenase
Contig296D	26225463_f3_114	338	3175	741	247	821	6.20E-82	Bacillus subtilis	P35163	resDtwo-component response regulatorBacillus subtilis spoVA to serA region.ompR proteinORFX17
Contig296D	26259657_f2_65	339	3176	1425	475	1155	2.50E-117	BACILLUS SUBTILIS	P54533	BFMBCDEHYDROGENASE) (LPD-VAL)
Contig296D	26306713_f2_101	340	3177	912	304	580	2.10E-56	Thermoanaerobacterium thermosulfurigenes	g1255237	xynBXynBThermoanaerobacterium thermosulfurigenes endoxylanase precursor(XynA) and membrane component of an ABC transporter (XynB) genes, complete cds and XynC (xynC) gene, partial cds.Description



Contig296D	26368950_f3_116	341	3178	1380	460	744	3.90E-76	Bacillus subtilis	P50729	recSDNA or RNA helicase, DNA-dependent ATPase Bacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sleB), ypeB,
Contig296D	26384682_f2_85	342	3179	1248	416	561	2.20E-54	Bacillus subtilis	P54389	ypjA conserved hypothetical protein ypiABacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, complete cds: putative
Contig296D	26597186_f2_68	343	3180	444	148	544	1.40E-52	Bacillus subtilis	P54534	yqiWYqiW Bacillus subtilis DNA, 283 Kb region containing skin element similar to hypothetical proteins from B. subtilis
Contig296D	26600137_c3_304	344	3181	531	177	188	7.40E-15	Bacillus subtilis	P17617	ypuF hypothetical protein X6Bacillus subtilis spoVA to serA region. ORFX6 cmkcytidine monophosphate
Contig296D	26754662_f1_25	345	3182	672	224	514	2.10E-49	Bacillus subtilis	P38493	kinase Bacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sleB), ypeB, ypfA, ypfB, c
Contig296D	26774062_f3_119	346	3183	1332	444	1670	6.70E-172	Bacillus subtilis	P50743	ypjC conserved hypothetical protein yphCBacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sleB), ypeB, ypfA,
Contig296D	2756288_f1_18	347	3184	183	61					

Contig296D	29457167_f1_43	348	3185	546	182	854	2.00E-85	Staphylococcus epidermidis	Q59908	dfrCdhydrofolate reductaseS.epidermidis thyF and dfrC genes.type I dihydrofolate reductase homology
Contig296D	29532252_c2_223	349	3186	195	65					
Contig296D	29570250_f3_113	350	3187	813	271	491	5.70E-47	Bacillus subtilis	P35154	ypuGconserved hypothetical protein ypuGBacillus subtilis spoVA to serA region. ORFX7
Contig296D	30085926_c2_256	351	3188	1554	518	1534	1.70E-157	Bacillus subtilis	P54547	yqjYyqjBacillus subtilis DNA, 283 Kb region containing skin element.similar to glucose-6-phosphate 1-dehydrogenase
Contig296D	30682927_f3_145	352	3189	828	276	211	2.70E-17	Bacillus subtilis	e1181488	ykoAYkcABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR_putative dioxygenase
Contig296D	31306926_f3_140	353	3190	891	297	215	4.40E-16	Saccharomyces cerevisiae	g609417	YLR361CYlr361cpSaccharomyces cerevisiae chromosome XII cosmid 8039.
Contig296D	31525262_f1_6	354	3191	393	131	275	4.40E-24	Bacillus subtilis	P54520	yqhZYqhZBacillus subtilis DNA, 283 Kb region containing skin element.similar to transcription termination
Contig296D	31799057_f1_17	355	3192	918	306	855	1.50E-85	Bacillus subtilis	P46352	ripXYqkMBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig296D	3182261_c1_190	356	3193	210	70	190	4.50E-15	BACILLUS THERMOPROTEOLYTICUS	P10245	ferredoxin [4Fe-4SPERREDOXINferredoxin 2[4Fe-4S
Contig296D	32078568_f2_94	357	3194	969	323	1734	1.10E-178	Staphylococcus aureus	P13954	thyEThyEStaphylococcus aureus multi-resistance plasmid pSK1 DNA containingtransposon Tn4003.thymidylate synthasethymidylate synthetase (AA 1-318)

Contig296D	33492927_f2_88	358	3195	705	235	358	7.10E-33	Bacillus subtilis	P39787	dnaDnaD proteinBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEFHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.
Contig296D	33543_f1_59	359	3196	246	82	272	1.30E-23	Bacillus subtilis	P16263	odhB2-oxoglutarate dehydrogenase complexB.subtilis 2-oxoglutarate dehydrogenase (odhA) gene 3' end, and dihydroliopamide transsuccinylase (odhB) gene, complete cds.dihydroliopamide acetyltransferasedihydroliopamide transsuccinylase (odhB; EC
Contig296D	33646056_f2_75	360	3197	294	98	188	7.40E-15	Bacillus subtilis	P50726	ypaA hypothetical protein ypaABacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortexlytic enzyme (sleB), ypeB, ypfA, ypfB, cyti
Contig296D	34017062_f2_97	361	3198	1101	367	537	7.70E-52	Borrelia burgdorferi	g2688704	BB0767UDP-N-acetylglucosamine-N-acetylmutarumyl-Borrelia burgdorferi (section 62 of 70) of the complete genome.similar to GB
Contig296D	34027217_f3_118	362	3199	999	333	986	2.00E-99	Bacillus subtilis	P50736	ypdA thioredoxin reductase homolog ypdABacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortexlytic enzyme (sleB), ypeB, ypfA, y
Contig296D	34415925_f3_106	363	3200	1134	378	905	7.70E-91	Bacillus subtilis	P36839	argDN-acetylornithine aminotransferaseB.subtilis (168) DNA for argC-F citrulline biosynthetic operon.

Contig296D	34430342_f1_29	364	3201	711	237	475	2.80E-45	Bacillus subtilis	e1184209	yugPunknownBacillus subtilis complete genome (section 17 of 21)
Contig296D	34432787_f2_87	365	3202	1221	407	672	3.80E-66	Bacillus subtilis	P42977	ypjPoly(A) polymeraseBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.38.9% of identical aminoacids with
Contig296D	35050_f1_38	366	3203	210	70					
Contig296D	35370250_f3_146	367	3204	222	74	199	5.00E-16	Bacillus subtilis	e1185402	yoZChypothetical protein yozCBacillus subtilis complete genome (section 11 of 21)
Contig296D	35975878_f3_132	368	3205	282	94	162	2.00E-11	Bacillus subtilis	P54169	ypgRconserved hypothetical protein ypgRBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.25.8% identity over 120 aa with the Synenococcus
Contig296D	36135875_f1_31	369	3206	1164	388	1034	1.70E-104	Bacillus subtilis	P42982	ypjHlipopolysaccharide biosynthesis-related pr homolog ypiHBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds
Contig296D	3915886_f2_66	370	3207	1014	338	1156	2.00E-117	Bacillus subtilis	P37941	bfmBABbranched chain alpha-keto acid dehydrogenaseBacillus subtilis branched chain alpha-keto acid dehydrogenaseE1-alpha, branched chain alpha-keto acid dehydrogenase E1-beta, andbranched chain alpha-keto acid dehydrogenase E2, complete cds,pyruvate dehyd
Contig296D	3944838_f1_44	371	3208	858	286	791	9.30E-79	Staphylococcus epidermidis	g886711	ORF3unknownS.epidermidis thyF and dfrC genes.
Contig296D	4007343_f2_98	372	3209	627	209	302	6.10E-27	Bacillus megaterium	g288301	ORF2hypothetical protein 2B.megaterium cytochrome P450meg. ORF1 and ORF2 genes.

Contig296D	4022203_f3_108	373	3210	1347	449	933	8.30E-94	Bacillus subtilis	P54521	yqiBYqiBBacillus subtilis DNA, 283 Kb region containing skin element similar to exodeoxyribonuclease VII (large
Contig296D	4086088_f1_2	374	3211	747	249	404	9.50E-38	Lactobacillus plantarum	e284231	argBacetylglutamate kinaseL.plantarum carA & ORF8 partial CDS, argC,J,B,D,F & ORF7 citrullinebiosynthetic operon.
Contig296D	4101018_f1_54	375	3212	669	223	507	1.20E-48	Bacillus subtilis	e1181525	ykoGYkoGBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.homologous to response regulators
Contig296D	4103377_f2_61	376	3213	615	205	498	1.00E-47	Lactobacillus plantarum	e284230	argJglutamate N-acetyltransferaseL.plantarum carA & ORF8 partial CDS, argC,J,B,D,F & ORF7 citrullinebiosynthetic operon.
Contig296D	4166443_c1_178	377	3214	2241	747	3168	0	Staphylococcus aureus	g483534	penicillin-binding protein 2S.aureus DNA for penicillin-binding protein 2.
Contig296D	4336687_f1_42	378	3215	678	226	465	3.30E-44	Methanococcus jannaschii	Q58206	MJ0796ABC transporter, ATP-binding proteinMethanococcus jannaschii section 66 of 150 of the complete genome.unassigned ATP-binding cassette proteinssimilar to SP
Contig296D	4476577_f2_81	379	3216	480	160	627	2.20E-61	Staphylococcus aureus	P50588	ndknucleoside diphosphate kinaseStaphylococcus aureus chorismate synthase (aroC) and nucleosidediphosphate kinase (ndk) genes, complete cds, dehydroinatesynthase (aroB) and geranylgeranyl pyrophosphate synthetase homolog(gerCC) genes, partial cds.ATP
Contig296D	4494143_f2_79	380	3217	588	196	105	7.30E-06	Micrococcus luteus	d1026194	hexs-acomponent A of hexaprenyl diphosphate synthaseMicrococcus luteus hexs-a, menG, hexs-b gene, complete cds.

Contig296D	4510443_f3_123	381	3218	2721	907	728	2.10E-100	Bacillus subtilis	P54394	dinGATP-dependent helicaseBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes,yjiABCDEFH genes, birA gene, panBCD genes, dinG gene, ypmB gene,aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.22.4% identity with Escherichia
Contig296D	4570393_f2_83	382	3219	1074	358	617	2.60E-60	Bacillus subtilis	P31102	aroBAroBB.subtilis dbpA, mtr(A,B), gerC(1-3), ndk, cheR, aro(B,E,F,H),trp(A-F), hisH, and tyrA genes, complete cds.
Contig296D	4689075_c1_196	383	3220	906	302	275	4.40E-24	Bacillus subtilis	d1020105	ydeEtranscriptional regulator (AraC/XylS famil) homolog ydeEBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.PROBABLE HTH_ARAC_FAMILY OF TRANSCRIPTIONAL
Contig296D	4726643_f1_4	384	3221	1236	412	1459	1.50E-149	Bacillus subtilis	d1013248	accCYqhXBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig296D	4860702_f1_33	385	3222	333	111			Staphylococcus aureus	Q05615	aroA3-phosphoshikimate-1-carboxyvinyltransferaseStaphylococcus aureus dehydroquinase synthase (aroB) gene, 3' endcds; 3-phosphoshikimate-1-carboxyvinyltransferase (aroA) gene,complete cds; ORF3, complete cds.
Contig296D	4860953_f2_84	386	3223	1311	437	1735	8.60E-179	Bacillus subtilis	g3169330	yoiNYoiNBacillus subtilis YojA (yoiA), YojB (yoiB), YojC (yoiC), YojD(yoiD), YojE (yoiE), YojF (yoiF), YojG (yoiG), YojH (yoiH), YojI(yoiI), YojJ (yoiJ), YojK (yoiK), YojL (yoiL), YojM (yoiM), YojN(yoiN), and YojO (yoiO) genes, complete cds; and OdhA (odh

Contig296D	4964202_f3_125	388	3225	675	225	719	4.00E-71	Bacillus subtilis	P39788	nthendonuclease IIIBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEFCHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.46.2% of identity to the Escherichia
Contig296D	5116018_f1_7	389	3226	240	80	107	2.80E-06	Escherichia coli	g1786624	xseBexodexoxyribonuclease small subunitEscherichia coli K-12 MG1655 section 38 of 400 of the completegenome.f80; 100 pct identical to EX7S_ECOLI SW
Contig296D	5118762_f1_52	390	3227	1332	444	495	2.20E-47	Bacillus subtilis	e1183083	yisQYisQBacillus subtilis complete genome (section 6 of 21)alternate gene name
Contig296D	5131412_f1_20	391	3228	1776	592	886	8.00E-89	Bacillus subtilis	P35164	resEtwo-component sensor histidine kinaseBacillus subtilis spoVA to serA region. ORFX18
Contig296D	5324137_f3_122	392	3229	987	329	497	1.30E-47	Bacillus subtilis	P42975	birAbiotin [acetyl-CoA-carboxylaseBacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEFCHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, completecds's.26.7% identity to the
Contig296D	5367140_f2_96	393	3230	186	62					
Contig296D	571932_f1_30	394	3231	393	131	352	3.10E-32	Bacillus subtilis	P42979	jojDunknownBacillus subtilis dihydropicolinate reductase (jojE) gene, completecds; poly(A) polymerase (jojI) gene, complete cds; biotinacetyl-CoA-carboxylase ligase (birA) gene, complete cds; jojC, jojD, jojF, jojG, jojH genes, complete cds's, putative
Contig296D	587813_f2_62	395	3232	471	157	337	1.20E-30	Bacillus subtilis	d1013247	accBYqhWBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig296D	5892177_f1_47	396	3233	186	62					

Contig296D	6414213_c1_188	397	3234	981	327	446	3.40E-42	Bacillus licheniformis	P30363	ansA AsparaginaseB. licheniformis ansA gene for asparaginase. the putative protein shows similarities with
Contig296D	6438767_f3_117	398	3235	1404	468	268	7.70E-23	Staphylococcus aureus	g1397239	ebpS elastin binding protein (ebpS) gene, complete cds.
Contig296D	6739462_f3_126	399	3236	624	208	415	6.50E-39	Bacillus subtilis	P50838	ypsA conserved hypothetical protein ypsA Bacillus subtilis (clone YAC15-6B) ponA gene, yppBCDEFG genes, ypqAE genes, yprAB genes, cotD gene, ypsABC genes, map gene, yptA gene, ypuA gene, kduD1 genes, kdgRKAT genes, ypwA gene, complete cds's putative
Contig296D	6821063_f1_58	400	3237	789	263	598	2.60E-58	Bacillus subtilis	P16263	odhB2-oxoglutarate dehydrogenase complexB. subtilis 2-oxoglutarate dehydrogenase (odhA) gene 3' end, and dihydrolipamide transsuccinylase (odhB) gene, complete cds. dihydrolipamide acetyltransferase dihydrolipamide transsuccinylase (odhB; EC
Contig296D	683417_f3_112	401	3238	924	308	668	1.00E-65	Bacillus subtilis	P54548	yqjKYqjKBacillus subtilis DNA, 283 Kb region containing skin element. similar to hypothetical proteins
Contig296D	6855301_f1_40	402	3239	204	68	140	9.00E-10	Bacillus subtilis	P54165	ypeQ hypothetical protein ypeQBacillus subtilis (YAC10-9 clone) DNA region between the serA and kdg loci. putative
Contig296D	7226552_c1_191	403	3240	195	65					
Contig296D	7242807_f2_70	404	3241	1425	475	1636	2.70E-168	Salmonella enterica	P14062	gnd6-phosphogluconate dehydrogenaseS. enterica gnd gene for 6-phosphogluconate dehydrogenase. phosphogluconate dehydrogenase (decarboxylating) 6-phosphogluconate dehydrogenase (AA 1-468)



Contig296D	7320257_f1_36	405	3242	3456	1152	463	1.40E-39	Bacillus subtilis	P54159	ypbRhypothetical protein ypbRBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.26.7% of identity in 165 aa to a Thermophilic
Contig296D	788937_f3_133	406	3243	468	156	395	8.60E-37	Bacillus subtilis	P54170	ypbPconserved hypothetical protein ypbPBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.putative
Contig296D	814052_f3_120	407	3244	777	259	857	9.40E-86	Micrococcus luteus	d1026195	menG2-hexaprenyl-1,4-naphthoquinoneMicrococcus luteus hexs-a, menG, hexs-b gene, complete cds.
Contig296D	863903_c1_150	408	3245	186	62					
Contig296D	866643_f1_41	409	3246	1062	354	185	4.60E-12	Mycobacterium tuberculosis	e1246003	MTV030.16putative ABC-transporter transmembrane subunitMycobacterium tuberculosis sequence v030.MTV030.16, possible ABC-transporter transmembrane
Contig296D	912757_f1_19	410	3247	552	184	307	1.80E-27	Bacillus subtilis	P35155	ypuHconserved hypothetical protein ypuHBacillus subtilis spo VA to serA region. ORFX8
Contig296D	970275_f1_35	411	3248	1164	388	1150	8.40E-117	Bacillus subtilis	P50840	ypsCconserved hypothetical protein ypsCBacillus subtilis (clone YAC15-6B) ponA gene, yppBCDEFG genes,ypqAE genes, yprAB genes, cotD gene, ypsABC genes, maP gene, yptAgene, ypuA gene, kduDI genes, kdgRKAT genes, ypwA gene, completecds's.putative
Contig296D	9783510_f2_60	412	3249	648	216	547	6.70E-53	Bacillus stearothermophilus	Q07906	argCBacillus stearothermophilus ornithine acetyltransferase (argI) andacetylglutamate kinase (argB) genes, complete cds's, argC gene, 3'end, and argD gene, 5' end.
Contig296D	9922962_f1_28	413	3250	1074	358	718	5.10E-71	Bacillus subtilis	P31114	gerC3GerC3B.subtilis dbpA, mtr(A,B), gerC(1-3), ndk, cheR, aro(B,E,F,H),trp(A-F), hisH, and tyrA genes, complete cds.alternate gene name

Contig296D	9970327_f3_121	414	3251	564	188	114	1.20E-05	Bacillus subtilis	P54390	ypjBhypothetical protein ypiB Bacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, complete cds's putative
Contig310D	11961568_c3_96	415	3252	945	315	1007	1.20E-101	Staphylococcus aureus	P11099	LAClacC protein in Staphylococcus aureus lacC and lacD genes. lacC polypeptide (AA 1-310)
Contig310D	13871068_c2_66	416	3253	666	222	877	7.20E-88	Bacillus subtilis	g1165309	rpsCS3 Bacillus subtilis ribosomal protein gene cluster, rpsJ, rplC, rplD, rplW, rplB, rpsS, rplV and rpsC genes, complete cds, and rplP gene, partial cds. ribosomal protein
Contig310D	13886593_c2_79	417	3254	252	84	96	4.10E-05	Lactococcus lactis	g727435	Lactococcus lactis N5-(1-carboxyethyl)-L-ornithine synthase (ceo) gene, complete cds. putative 6-kDa protein
Contig310D	1408450_f1_8	418	3255	564	188	104	8.30E-06	Pyrococcus horikoshii	d1028868	PHLG013100aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 1534516-1552267 nt position (complementary strand), clone
Contig310D	14277217_c3_88	419	3256	516	172	626	2.80E-61	Bacillus subtilis	P21467	rpsE ribosomal protein S5 Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCD1, rpsQNHMK) genes, integral membrane protein (secY) gene, adenylate kinase (ack) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase alp
Contig310D	14312750_c1_57	420	3257	492	164	665	2.10E-65	Staphylococcus carnosus	Q00990	rplM ribosomal protein L13S. carnosus rplM gene for ribosomal protein L13. Escherichia coli ribosomal protein L13
Contig310D	14346067_c2_77	421	3258	1023	341	288	1.90E-25	Vigna radiata	g1184121	auxin-induced protein Vigna radiata clone M11-3 auxin-induced protein mRNA, complete cds.

Contig310D	16829627_c3_90	422	3259	372	124	484	3.20E-46	Bacillus subtilis	g1044989	rpsMribosomal protein S13Bacillus subtilis ribosomal protein (rpIPNXEFROQ, rpmCDJ, rpsQNHEMK) genes, integral membrane protein (secY) gene, adenylatekinase (adk) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase al
Contig310D	16835333_c3_82	423	3260	840	280	1198	6.90E-122	Bacillus subtilis	g1165306	rpBL2Bacillus subtilis ribosomal protein gene cluster, rpsI, rplC, rplD, rplW, rplB, rpsS, rplV and rpsC genes, complete cds, and rplP gene, partial cds. ribosomal protein
Contig310D	197127_f2_14	424	3261	1965	655	285	7.50E-22	Rhizobium sp. NGR234	P55706	y4xNY4xNRhizobium sp. NGR234 plasmid pNGR234a, section 43 of 46 of the complete plasmid sequence. hypothetical 71 kd protein; similar to Escherichia
Contig310D	19822151_c3_91	425	3262	372	124	433	8.00E-41	Bacillus subtilis	g142464	rpIQribosomal protein L17B. subtilis initiation factor 1, ribosomal proteins B, S13, S11, L17 and RNA polymerase alpha core protein genes, complete cds. Escherichia coli ribosomal protein L17
Contig310D	21751063_c2_64	426	3263	579	193	621	9.60E-61	Bacillus stearothermophilus	P28600	rp1Cribosomal protein L3B. stearothermophilus genes rplC and rplD for ribosomal proteins L3 and L4, respectively. Escherichia coli ribosomal protein L3
Contig310D	21915941_c2_69	427	3264	372	124	571	1.90E-55	Bacillus subtilis	P12875	rpINribosomal protein L14Bacillus subtilis ribosomal protein (rpIPNXEFROQ, rpmCDJ, rpsQNHEMK) genes, integral membrane protein (secY) gene, adenylatekinase (adk) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase al

Contig310D	22002318_c1_51	428	3265	330	110	390	2.90E-36	BACILLUS STEAROTHER MOPHILUS	P04455	RPLX, ribosomal protein L2450S RIBOSOMAL PROTEIN L24Escherichia coli ribosomal protein L24
Contig310D	23572128_c1_53	429	3266	183	61	282	8.10E-25	Staphylococcus aureus	g2078380	L30, ribosomal protein L30Staphylococcus aureus NCTC 8325 ribosomal protein L30 (L30), ribosomal protein L15 (L15) and SecY (secY) genes, complete cds.
Contig310D	23572180_c1_55	430	3267	222	74	326	1.80E-29	Bacillus subtilis	g142459	infA initiation factor 1B, subtilis initiation factor 1, ribosomal proteins B, S13, S11, L17 and RNA polymerase alpha core protein genes, complete cds.
Contig310D	23573587_c3_85	431	3268	201	67	284	5.00E-25	Bacillus subtilis	P12878	rpsN ribosomal protein L14Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ, rpsQNHEMK) genes, integral membrane protein (secY) gene, adenylate kinase (adk) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase al
Contig310D	23603450_c2_78	432	3269	585	195					
Contig310D	23632750_c3_102	433	3270	525	175	726	7.20E-72	Staphylococcus aureus	g894289	asp23 alkaline shock protein 23asp23=alkaline shock protein 23 {methicillin resistant}[Staphylococcus aureus, 912, Genomic, 1360 ntMethod LACRlacR repressorStaphylococcus aureus lac repressor (lacR) gene, complete cds and lacA repressor (lacA), partial cds.
Contig310D	23634813_c1_58	434	3271	771	257	970	1.00E-97	Staphylococcus aureus	P16644	
Contig310D	23683375_c1_59	435	3272	507	169	583	1.00E-56	Streptococcus mutans	P26423	lacA galactosidase acetyltransferaseStreptococcus mutans lac operon.
Contig310D	23882135_c3_92	436	3273	873	291	665	2.10E-65	Bacillus subtilis	e1182078	ybxA unknownBacillus subtilis complete genome (section 1 of 21) alternate gene name
Contig310D	24337750_c3_97	437	3274	981	327	1524	2.00E-156	Staphylococcus aureus	P11100	LACD lacD proteinStaphylococcus aureus lacC and lacD genes.lacD polypeptide (AA 1-326)

Contig310D	24397127_c3_98	438	3275	1776	592	2460	1.30E-255	Staphylococcus aureus	P11162	LACεphosphotransferase system enzyme II, lactose-specific, factor IIS.aureus enzyme III-lac (lacF), enzyme II-lac (lacE), andphospho-beta-galactosidase (lacG) genes, complete cds.enzyme II-lac (lacE)
Contig310D	24402217_c1_56	439	3276	405	135	560	2.80E-54	Bacillus subtilis	P04969	rpsKribosomal protein S11B.subtilis initiation factor I, ribosomal proteins B, S13, S11, L17and RNA polymerase alpha core protein genes, complete cds.Escherichia coli ribosomal protein S11ribosomal protein S11
Contig310D	24648312_f3_34	440	3277	747	249	905	7.70E-91	Staphylococcus aureus	g845686	Staphylococcus aureus lac repressor (lacR) gene, complete cds andlacA repressor (lacA), partial cds. ORF-27
Contig310D	24744040_c1_63	441	3278	1065	355					
Contig310D	24806662_c2_67	442	3279	237	79	252	1.20E-21	Bacillus subtilis	P12873	rpmCribosomal protein L29Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ,rpsQNHMK) genes, integral membrane protein (secY) gene, adenylatekinase (adk) gene, methionine aminopeptidase (map) gene,initiation factor I (infA) gene, RNA polymerase al
Contig310D	25908568_c2_71	443	3280	453	151	706	9.50E-70	Staphylococcus aureus	O06445	L15ribosomal protein L15Staphylococcus aureus NCTC 8325 ribosomal protein L30 (L30),ribosomal protein L15 (L15) and SecY (secY) genes, complete cds.
Contig310D	26360036_c1_52	444	3281	387	129	429	2.10E-40	Bacillus subtilis	P46899	rplRribosomal protein L18Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ,rpsQNHMK) genes, integral membrane protein (secY) gene, adenylatekinase (adk) gene, methionine aminopeptidase (map) gene,initiation factor I (infA) gene, RNA polymerase al

Contig310D	26773450_c2_68	445	3282	285	95	380	3.30E-35	Bacillus subtilis	P12874	rpsQribosomal protein S17 (BS16)B.subtilis S10/spc operon rpmC, rpsQ, rplN, rplX, rplE, rpsN genes.Escherichia coli ribosomal protein S17S17 protein (AA 1-87)
Contig310D	26776678_c3_84	446	3283	372	124	431	1.30E-40	Bacillus stearothermophilus	P23311	RPLVribosomal protein L22B.stearothermophilus gene for ribosomal proteins L2, S19, L22, S3, and L16.Escherichia coli ribosomal protein L22
Contig310D	2735801_c1_62	447	3284	1848	616	274	1.10E-20	Rhizobium sp. NGR234	P55706	y4xNY4xNRhizobium sp. NGR234 plasmid pNGR234a, section 43 of 46 of the complete plasmid sequence.hypothetical 71 kd protein; similar to Escherichia
Contig310D	29328312_c3_83	448	3285	339	113	415	6.50E-39	Bacillus subtilis	d1009468	rpsSRibosomal Protein S19Bacillus subtilis genes for ribosomal proteins L13, L4, L23, L2,S19, L22, S3 and L16, partial and complete cds.ribosomal protein
Contig310D	30742165_c1_54	449	3286	1323	441	1919	2.70E-198	Staphylococcus carnosus	Q05217	secYsecY proteinS.carnosus secY gene.secY protein
Contig310D	31377318_c2_65	450	3287	291	97	297	2.10E-26	Bacillus subtilis	P42924	rplWRibosomal Protein L23Bacillus subtilis genes for ribosomal proteins L13, L4, L23, L2,S19, L22, S3 and L16, partial and complete cds.ribosomal protein
Contig310D	3304562_c1_60	451	3288	366	122	411	1.70E-38	Staphylococcus aureus	P02909	LACFS.aureus enzyme III-lac (lacF), enzyme II-lac (lacE), andphospho-beta-galactosidase (lacG) genes, complete cds.enzyme III-lac (lacF)
Contig310D	33437802_c3_89	452	3289	669	223	772	9.60E-77	Bacillus subtilis	P16304	adkadenylate kinaseBacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ,rpsQNHMK) genes, integral membrane protein (secY) gene, adenylylatekinase (adk) gene, methionine aminopeptidase (map) gene,initiation factor 1 (infA) gene, RNA polymerase alpha (r

Contig310D	34017517_c3_93	453	3290	828	276	714	1.30E-70	Bacillus subtilis	e1182080	ybaF hypothetical protein ybaF Bacillus subtilis complete genome (section 1 of 21)
Contig310D	34188213_c3_86	454	3291	423	141	579	2.70E-56	Bacillus subtilis	g1044978	rpsH ribosomal protein S8 Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ, rpsQNHMK) genes, integral membrane protein (secY) gene, adenylate kinase (adk) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase alp
Contig310D	34406562_c2_73	455	3292	867	289	644	3.50E-63	Bacillus subtilis	e1182079	ybaE unknown Bacillus subtilis complete genome (section 1 of 21) similar to ABC transporter (ATP-binding protein)
Contig310D	34647177_c3_87	456	3293	558	186	594	7.00E-58	Bacillus stearothermophilus	g143419	ribosomal protein L6 ribosomal protein L6B.stearothermophilus ribosomal protein L6 gene, complete cds.
Contig310D	34651577_f2_15	457	3294	1047	349	502	3.90E-48	Bacillus subtilis	d1023111	yceBYceB Bacillus subtilis genomic DNA, 22 to 25 degree region, completed cds. homologue of a hypothetical 36.6 kDa protein in
Contig310D	36135437_c3_81	458	3295	648	216	676	1.40E-66	Bacillus stearothermophilus	P28601	rplD ribosomal protein L4B.stearothermophilus genes rplC and rplD for ribosomal proteins L3 and L4, respectively. Escherichia coli ribosomal protein L4
Contig310D	36226575_c2_70	459	3296	558	186	766	4.20E-76	Bacillus subtilis	P12877	rplE ribosomal protein L5 Bacillus subtilis ribosomal protein (rplPNXEFROQ, rpmCDJ, rpsQNHMK) genes, integral membrane protein (secY) gene, adenylate kinase (adk) gene, methionine aminopeptidase (map) gene, initiation factor 1 (infA) gene, RNA polymerase alp
Contig310D	4165677_c3_94	460	3297	807	269	544	1.40E-52	Bacillus subtilis	e1182081	truA pseudouridylyl synthase I Bacillus subtilis complete genome (section 1 of 21) alternate gene name

Contig310D	4564036_c3_101	461	3298	1044	348	898	4.30E-90	Bacillus subtilis	e1182735	yfmJYfmJBacillus subtilis complete genome (section 5 of 21) similar to quinone oxidoreductase
Contig310D	4694030_c3_103	462	3299	1236	412	311	6.80E-28	Mycobacterium smegmatis	g2073532	Mycobacterium smegmatis catalase-peroxidase (katG), putative arabinosyl transferase (embC, embA, embB), genes complete cds and putative propionyl-coA carboxylase beta chain (pccB) genes, partial cds.orf7; hypothetical membrane protein
Contig310D	4697262_c3_95	463	3300	540	180	806	2.40E-80	Streptococcus mutans	D43258	galactose-6-phosphate isomerase subunit LacB
Contig310D	4714817_c2_76	464	3301	879	293					
Contig310D	4879442_c2_75	465	3302	576	192	981	6.80E-99	Staphylococcus aureus	P11175	LACbeta-galactosidase, S. aureus enzyme III-lac (lacF), enzyme II-lac (lacE), and phospho-beta-galactosidase (lacG) genes, complete cds. Agrobacterium beta-glucosidase phospho-beta-galactosidase (lacG)
Contig310D	4886592_c1_50	466	3303	450	150	614	5.30E-60	Bacillus subtilis	P14577	rplPribosomal protein L16Bacillus subtilis complete genome (section 1 of 21)
Contig310D	4897202_c2_72	467	3304	768	256	996	1.80E-100	Bacillus sp.	d1025104	rpoARNA polymerase alpha subunitBacillus sp. gene for initiation factor IF-I, RNA polymerase alpha subunit and ribosomal proteins, partial and complete cds.
Contig310D	4901712_c2_74	468	3305	408	136	496	1.70E-47	Bacillus subtilis	e1182083	rpsRibosomal protein S9Bacillus subtilis complete genome (section 1 of 21)
Contig310D	55437_c3_99	469	3306	867	289	1458	1.90E-149	Staphylococcus aureus	P11175	LACbeta-galactosidase, S. aureus enzyme III-lac (lacF), enzyme II-lac (lacE), and phospho-beta-galactosidase (lacG) genes, complete cds. Agrobacterium beta-glucosidase phospho-beta-galactosidase (lacG)



Contig313D	10736002_c3_112	470	3307	1521	507	2313	4.90E-240	Staphylococcus aureus	Q53638	LYSSyl-tRNA synthetaseStaphylococcus aureus lysyl-tRNA synthetase gene, complete cds,transfer RNA (tRNA) genes, 5S ribosomal RNA (5S rRNA) gene, 16S ribosomal RNA (16S rRNA) gene, 23S ribosomal RNA (23S rRNA) gene.
Contig313D	11210316_c3_106	471	3308	195	65	166	1.60E-12	Bacillus subtilis	P37557	yabOunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	12142768_f3_62	472	3309	300	100	110	3.50E-06	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position,clone
Contig313D	12929625_c3_95	473	3310	810	270	819	1.00E-81	Bacillus subtilis	P37541	yaaTunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to signal peptidase II
Contig313D	13759688_c3_93	474	3311	615	205	527	8.80E-51	Bacillus subtilis	P37537	tmkunknownB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig313D	14849093_c1_63	475	3312	321	107	123	5.70E-08	Mitochondrion Chondrus crispus	e138028	putative orf79, 1C.crispus complete mitochondrial genome.unique orf
Contig313D	16522641_f3_46	476	3313	597	199	202	2.40E-16	Pyrococcus horikoshii	d1027803	PHCU003146aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 609561-620132 nt position,clonecontains prokaryotic membrane lipoprotein lipid
Contig313D	16594202_c1_73	477	3314	480	160	383	1.60E-35	Bacillus subtilis	P29252	folk7,8-dihydro-6-hydroxymethylpterin-pyrophosphokinB. subtilis DNA, 180 kilobase region of replication origin.2-amino-4-hydroxy-6-hydroxymethyldihydropteridine pyrophosphokinase
Contig313D	190875_f2_22	478	3315	210	70					
Contig313D	194142_c3_101	479	3316	1386	462	1339	7.90E-137	Bacillus subtilis	d1005827	tms26temperature sensitive cell divisionB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name

Contig313D	211687_c2_87	480	3317	897	299	985	2.60E-99	Bacillus subtilis	P37565	yaCUnknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	22694002_c2_86	481	3318	546	182	544	1.40E-52	Bacillus subtilis	P37472	hprthypoxanthine-guanine phosphoribosyltransferaseB. subtilis DNA, 180 kilobase region of replication origin.hypoxanthine phosphoribosyltransferase
Contig313D	23445130_c3_108	482	3319	417	139	134	3.40E-08	Bacillus subtilis	e1182000	yaCAcell-cycle protein homolog yaABacillus subtilis complete genome (section 1 of 21)similar to cell-cycle protein
Contig313D	23601702_c3_98	483	3320	891	297	919	2.50E-92	Bacillus subtilis	P37468	ksgAhigh level kasgamyacin resistanceB. subtilis DNA, 180 kilobase region of replication origin.rRNA (adenine-N6-)-methyltransferase
Contig313D	23631327_c2_79	484	3321	966	322	1225	9.50E-125	Corynebacterium ammoniagenes	g2289093	prsPRPP synthetaseCorynebacterium ammoniagenes N-acetyl glucosamine 1-phosphateuridylyltransferase (glmU) gene, partial cds, and PRPP-synthetase(prs) gene, complete cds.
Contig313D	23642135_c3_94	485	3322	357	119	389	3.70E-36	Bacillus subtilis	P37538	yaAQunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	23860952_c3_107	486	3323	882	294	267	1.00E-22	Bacillus subtilis	e1182000	yaCAcell-cycle protein homolog yaABacillus subtilis complete genome (section 1 of 21)similar to cell-cycle protein
Contig313D	24647936_c2_84	487	3324	408	136	161	5.40E-12	Bacillus subtilis	P37471	divICunknownB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	24649092_c1_72	488	3325	378	126	351	3.90E-32	Staphylococcus haemolyticus	g118003	folQdihydroneopterin aldolaseStaphylococcus haemolyticus cysteine synthase A (cysK) anddihydroneopterin aldolase (folQ) genes, partial cds, anddihydropteroate synthase (folP) gene, complete cds.DHNA
Contig313D	24663892_c2_80	489	3326	1881	627	1224	1.20E-124	Bacillus subtilis	P37474	mfdtranscription-repair coupling factorB. subtilis DNA, 180 kilobase region of replication origin.

Contig313D	24790916_c3_109	490	3327	2106	702	2133	5.80E-221	Bacillus subtilis	P37476	ftsH cell division proteinB. subtilis DNA, 180 kilobase region of replication origin.FtsH/SEC18/CDC48-type ATP-binding domain homology
Contig313D	25662965_c3_102	491	3328	729	243	463	5.30E-44	Bacillus subtilis	d1005829	ctc expressed at the end of exponential growth underB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	26839660_c2_76	492	3329	855	285	655	2.40E-64	Bacillus subtilis	P37544	yabC unknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	2928502_c2_88	493	3330	960	320	1166	1.70E-118	Bacillus subtilis	d1005850	cysKcysteine synthetase AB. subtilis DNA, 180 kilobase region of replication origin.threonine dehydratase
Contig313D	31446881_c1_64	494	3331	351	117	194	1.70E-15	Bacillus subtilis	P37542	yabA unknownB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	32615811_f1_17	495	3332	189	63					
Contig313D	33225017_c1_68	496	3333	867	289	792	7.30E-79	Bacillus subtilis	P37551	purR unknownB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig313D	33313817_c3_100	497	3334	333	111	323	3.60E-29	Bacillus megaterium	P28016	spoVGspoVG proteinB.megaterium spoVG and tms genes.
Contig313D	3361326_c3_90	498	3335	207	69					
Contig313D	34001510_c1_67	499	3336	798	266	916	5.30E-92	Bacillus subtilis	P37545	yabD unknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	34428515_c3_99	500	3337	285	95	284	5.00E-25	Bacillus subtilis	P37466	veg unknownB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	34571011_c2_81	501	3338	1608	536	1712	2.40E-176	Bacillus subtilis	P37474	mfdtranscription-repair coupling factorB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	3553_c2_75	502	3339	972	324	382	2.00E-35	Bacillus subtilis	P37540	holB similar to B. subtilis DnaHB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig313D	3916087_c1_65	503	3340	261	87	243	1.10E-20	Bacillus subtilis	e1181968	yazA conserved hypothetical protein yazABacillus subtilis complete genome (section 1 of 21) similar to hypothetical proteins
Contig313D	3937950_f3_43	504	3341	186	62					

Contig313D	3938838_c3_111	505	3342	846	282	1087	4.00E-110	Staphylococcus haemolyticus	Q59919	folPdhidhydropteroate synthaseStaphylococcus haemolyticus cysteine synthase A (cysK) anddihydroneopterin aldolase (folQ) genes, partial cds, anddihydropteroate synthase (folP) gene, complete cds.DHPS
Contig313D	4723192_c3_103	506	3343	606	202	539	4.70E-52	Bacillus subtilis	P37470	spoVCstage V sporulationB. subtilis DNA, 180 kilobase region of replication origin.thermosensitive mutant blocks spore coat formation
Contig313D	4775312_c2_85	507	3344	405	135	436	3.90E-41	Bacillus subtilis	P37560	yabRunknownB. subtilis DNA, 180 kilobase region of replication origin.orf128; homologous to RNA binding domain of E. coli
Contig313D	4884625_c3_97	508	3345	549	183	445	4.30E-42	Bacillus subtilis	P37547	yabFunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	5344015_c2_83	509	3346	1281	427	849	6.60E-85	Bacillus subtilis	P37556	yabNunknownB. subtilis DNA, 180 kilobase region of replication origin.beta- lactamase regulatory protein homologsimilar to hypothetical proteins
Contig313D	5367813_c2_74	510	3347	543	181	432	1.00E-40	Escherichia coli	P37354	speGSPermidine N1-acetyltransferase (EC 2.3.1.57)E.coli genomic DNA, Kohara clone #308(35.3-35.7 min.) ORF_ID
Contig313D	6015842_c2_78	511	3348	900	300	750	2.10E-74	Bacillus subtilis	P37550	yabHunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig313D	6136562_c1_69	512	3349	402	134	361	3.40E-33	Bacillus subtilis	P37552	yabJunknownB. subtilis DNA, 180 kilobase region of replication origin.hypothetical protein H10719similar to hypothetical proteins
Contig313D	6742943_c1_66	513	3350	1983	661	2292	8.10E-238	Bacillus subtilis	P37465	metSmethionyl-tRNA synthetaseB. subtilis DNA, 180 kilobase region of replication origin.
Contig313D	761_c3_96	514	3351	750	250	541	2.90E-52	Bacillus subtilis	P37543	yabBunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins

Contig313D	781880_f3_50	515	3352	339	113	114	2.40E-06	Schizosaccharo myces pombe	e317491	SPBC3D6.14unknownS.pombe chromosome II cosmid c3D6.SPBC3D6.14c, unknown; partial; serine rich,
Contig313D	829800_c3_104	516	3353	1575	525	597	3.40E-58	Bacillus subtilis	P37555	yabMsimilar to Spo VBB. subtilis DNA, 180 kilobase region of replication origin.similar to amino acid transporter
Contig313D	976638_c3_92	517	3354	1371	457	556	7.40E-54	Bacillus subtilis	P37536	yaaOsimilar to lysine decarboxylaseB. subtilis DNA, 180 kilobase region of replication origin.similar to lysine decarboxylase
Contig315D	10657827_f2_7	518	3355	1401	467	393	1.40E-36	Streptomyces pristinaespiralis	e304997	Sequence 6 from Patent WO9408014.unnamed protein product
Contig315D	11756543_c1_18	519	3356	231	77					
Contig315D	1207507_c3_32	520	3357	1245	415	1112	9.00E-113	Bacillus subtilis	d1020148	ydgFamino acid ABC transporter (permease) homolog ydgFBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.PROBABLE AMINO ACID TRANSPORT PERMIASE.
Contig315D	157807_f2_10	521	3358	1584	528	1780	1.50E-183	Staphylococcus sciuri	e316580	CTORF585S.sciuri mecA gene, strain K11 (792).
Contig315D	16048828_f1_3	522	3359	261	87					
Contig315D	16410912_c1_20	523	3360	279	93					
Contig315D	24251400_c1_23	524	3361	792	264	721	2.40E-71	Staphylococcus aureus	g1854577	lytRStaphylococcus aureus lytS and lytR genes, complete cds.
Contig315D	25431558_c3_38	525	3362	705	235	855	1.50E-85	Staphylococcus aureus	g1575026	lrgBLrgBStaphylococcus aureus holin-like protein LrgA (lrgA) and LrgB(lrgB) genes, complete cds.LytSR-regulated gene; similar to E.coli yohK
Contig315D	25433452_c3_36	526	3363	1791	597	1867	8.90E-193	Staphylococcus aureus	g862312	lytSStaphylococcus aureus lytS and lytR genes, complete cds.
Contig315D	25585932_f2_4	527	3364	276	92	249	2.50E-21	Bacillus subtilis	d1020109	ydeIhypothetical protein ydeIBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.FUNCTION UNKNOWN.

Contig315D	26188837_f2_6	528	3365	975	325	838	9.70E-84	Bacillus subtilis	g2293449	opuBCcholine binding protein precursorBacillus subtilis choline transport system including ATPase(opuBA), transmembrane protein (opuBB), choline binding proteinprecursor (opuBC) and transmembrane protein (opuBD) genes, completecds; and unknown gene part o
Contig315D	26751887_f2_8	529	3366	954	318	297	2.10E-26	Aquifex aeolicus	g2984043	aq_1727putative proteinAquifex aeolicus section 85 of 109 of the complete genome.
Contig315D	2833431_c1_21	530	3367	195	65					
Contig315D	30367767_c3_34	531	3368	1533	511	339	1.10E-30	Pyrococcus horikoshii	d1027272	PHDC009273aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 124750-131579 nt position(complementary strand), clonecontains soybean trypsin inhibitor (Kunitz)
Contig315D	34016937_f2_5	532	3369	1383	461	1178	9.10E-120	Bacillus subtilis	g2271389	opuCAATPaseBacillus subtilis osmoprotectant transport system OpuC includingATPase (opuCA), transmembrane protein (opuCB), osmoprotectantbinding protein precursor (opuCC) and transmembrane protein (opuCD)genes, complete cds.OpuCA; part of the osmoprotectan
Contig315D	34273436_c1_19	533	3370	855	285	372	2.30E-34	Bacillus subtilis	P54544	yqjGYqjGBacillus subtilis DNA, 283 Kb region containing skin element similar to lipoprotein SpoIIJ-like
Contig315D	34554692_c3_37	534	3371	474	158	403	1.20E-37	Staphylococcus aureus	g1575025	lrgAholin-like protein LrgASStaphylococcus aureus holin-like protein LrgA (lrgA) and LrgB(lrgB) genes, complete cds.LytSR-regulated gene; similar to E.coli yohJ

Contig315D	36134678_f1_2	535	3372	699	233	674	2.30E-66	Bacillus subtilis	g2271392	opuCDtransmembrane proteinBacillus subtilis osmoprotectant transport system OpuC includingATPase (opuCA), transmembrane protein (opuCB), osmoprotectantbinding protein precursor (opuCC) and transmembrane protein (opuCD)genes, complete cds.OpuCD; part of th
Contig315D	36596878_f3_12	536	3373	351	117					
Contig315D	3906718_c3_39	537	3374	1065	355	747	4.30E-74	Bacillus subtilis	d1023636	ydjLdehydrogenaseBacillus subtilis genomic DNA containing gutA to cotA region, 48degree.putative
Contig315D	4725068_f1_1	538	3375	645	215	605	4.80E-59	Bacillus subtilis	g2271390	opuCBtransmembrane proteinBacillus subtilis osmoprotectant transport system OpuC includingATPase (opuCA), transmembrane protein (opuCB), osmoprotectantbinding protein precursor (opuCC) and transmembrane protein (opuCD)genes, complete cds.OpuCB; part of th
Contig315D	7242128_f3_15	539	3376	345	115	352	3.10E-32	Staphylococcus sciuri	e314909	hypothetical proteinS.sciuri mecA gene & ORF's 450, 145 & 179.ORF450
Contig315D	882143_f3_16	540	3377	255	85					
Contig329D	10241287_c2_143	541	3378	663	221					
Contig329D	1042202_c1_119	542	3379	1074	358	625	3.60E-61	Escherichia coli	P23861	potDSpermidine/putrescine-binding periplasmicEscherichia coli genomic DNA.(25.1 - 25.5 min).f348: 100 pct identical to POTD_ECOLI SW
Contig329D	10579000_c2_154	543	3380	957	319	728	4.40E-72	Bacillus subtilis	P24009	ciaBCiaB proteinBacillus subtilis genomic DNA 23.9kB fragment.putative
Contig329D	10928_c1_127	544	3381	1242	414	239	9.10E-18	Rhodobacter capsulatus	g3128293	hypothetical proteinRhodobacter capsulatus strain SB1003, partial genome.
Contig329D	10969052_c3_165	545	3382	1725	575	2602	1.20E-270	Staphylococcus aureus	P51183	ptsIphosphoenolpyruvate-protein phosphataseS.aureus ptsH and ptsI genes.

Contig329D	1173177_f3_103	546	3383	1053	351	691	3.70E-68	Escherichia coli	P22564	yaaHypothetical 32.6 kD protein in lytB-dapBEscherichia coli K-12 MG1655 section 3 of 400 of the complete genome.o304; 100 pct identical to YAAF_ECOLI SW
Contig329D	1178828_c2_137	547	3384	705	235	642	5.70E-63	Bacillus subtilis	P12046	purCphosphoribosylaminoimidazole succinocarboxamideB.subtilis pur operon encoding purine biosynthesis enzymes, 12 genes.phosphoribosylaminoimidazole succinocarboxamide synthasephosphoribosyl aminoimidazole succinocarboxamide
Contig329D	1179542_c3_175	548	3385	222	74					
Contig329D	13864213_f3_83	549	3386	234	78	186	1.20E-14	Bacillus subtilis	e1185044	yzkGhypothetical protein ykzGBacillus subtilis complete genome (section 8 of 21)
Contig329D	13866257_c1_124	550	3387	258	86	100	1.60E-05	Saccharomyces cerevisiae	e222102	SMF1unknown proteinS.cerevisiae 10.6kbp fragment from chromosome XV.internal to SMF1
Contig329D	13869091_f2_68	551	3388	294	98	246	5.30E-21	Bacillus subtilis	P34959	QOXDquinol oxidaseBacillus subtilis AA3-600 quinol oxidase (QOXA, QOXB, QOXC, QOXD)genes, complete cds.alternate gene name
Contig329D	14460882_c3_176	552	3389	240	80	321	5.90E-29	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds. ORF1
Contig329D	14642135_c1_126	553	3390	1905	635	2456	3.40E-255	Bacillus subtilis	e1185067	ylaGGTP-binding elongation factor homolog ylaGBacillus subtilis complete genome (section 8 of 21)similar to GTP-binding elongation factor
Contig329D	14650302_c1_110	554	3391	264	88	179	6.60E-14	Bacillus subtilis	P12049	yexAconserved hypothetical protein yexABacillus subtilis complete genome (section 4 of 21)similar to hypothetical proteins
Contig329D	156502_f1_21	555	3392	243	81					
Contig329D	19537562_f2_66	556	3393	198	66					



Contig329D	19804703_c2_138	557	3394	747	249	696	1.10E-68	Bacillus subtilis	P12041	purL,phosphoribosylformylglycinamidine synthetase IIB,subtilis pur operon encoding purine biosynthesis enzymes, 12genes,phosphoribosylformylglycinamidine synthase component Iphosphoribosylformyl glycine synthetase I
Contig329D	21648962_c3_163	558	3395	1827	609	1793	6.20E-185	Streptococcus pyogenes	g517205	67 kDa Myosin-crossreactive streptococcalStreptococcus pyogenes 42 KD protein (ORF1) gene and 67 KDMYosin-crossreactive streptococcal antigen gene, complete cds. ORF2
Contig329D	21759653_f3_102	559	3396	609	203	552	2.00E-53	Bacillus subtilis	P34958	QOXCquinol oxidaseBacillus subtilis AA3-600 quinol oxidase (QOXA, QOXB, QOXC, QOXD)genes, complete cds.cytochrome-c oxidase chain IIIalternate gene name
Contig329D	21915911_f1_24	560	3397	894	298	229	3.30E-19	Bacillus subtilis	e1181521	ykoCYkoCBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.
Contig329D	22775126_f2_59	561	3398	633	211	263	8.30E-23	Bacillus subtilis	e1181523	ykoEYkoEBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.
Contig329D	22931642_c2_132	562	3399	1224	408	1250	2.10E-127	Staphylococcus aureus	d1024918	fntFntStaphylococcus aureus DNA for Fnt, complete cds.
Contig329D	23442177_f2_43	563	3400	669	223	429	2.10E-40	Bacillus subtilis	g1377842	yktBunknownBacillus subtilis ampS-nprE gene region.
Contig329D	23448838_f1_33	564	3401	873	291	786	3.20E-78	Bacillus subtilis	P54382	foldYqiABacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig329D	23459753_f3_78	565	3402	276	92					pdhApyruvate dehydrogenase (lipoamide)B. stearothermophilus pdhA, pdhB, pdhC, pdhD genes for pyruvate dehydrogenase multienzyme complex (E.C. numbers 1.2.4.1, 2.3.1.12,1.8.1.4).pyruvate dehydrogenase (lipoamide) alpha chainE1 alpha subunit
Contig329D	23532327_c2_145	566	3403	1113	371	1432	1.10E-146	Bacillus stearothermophilus	P21873	

Contig329D	23695900_c2_139	567	3404	1551	517	1349	6.90E-138	Bacillus subtilis	P00497	purFphosphoribosylpyrophosphate amidotransferaseB.subtilis pur operon encoding purine biosynthesis enzymes, 12genes.amidophosphoribosyltransferasep hosphoribosylpyrophosphate amidotransferase
Contig329D	23730340_c2_147	568	3405	1422	474	2270	1.70E-235	Staphylococcus aureus	g48874	pdhDdihydrolipoamide dehydrogenaseS.aureus pdhB, pdhC and pdhD genes for pyruvate decarboxylase,dihydrolipoamide acetyltransferase and dihydrolipoamidedehydrogenase.dihydrolii poamide dehydrogenase
Contig329D	23834680_c3_162	569	3406	210	70					
Contig329D	24025253_fl_34	570	3407	321	107	198	1.10E-14	Clostridium paraputrificum	d1024701	chiBchitinase BClostridium paraputrificum gene for chitinase B, complete cds.
Contig329D	24256551_c3_160	571	3408	1071	357	938	2.50E-94	Bacillus subtilis	P12043	purMphosphoribosylaminoimidazole synthetaseB.subtilis pur operon encoding purine biosynthesis enzymes, 12genes.phosphoribosylformylglycinamidi ne cyclo-ligasephosphoribosyl aminoimidazole synthetase (PUR-M)
Contig329D	24314067_c1_129	572	3409	957	319	382	2.00E-35	Bacillus subtilis	e334771	ylbCYlbC proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to hypothetical proteins from B. subtilis
Contig329D	24415885_c1_128	573	3410	1227	409	651	6.40E-64	Bacillus subtilis	O07639	ylaOcell-division protein homolog ylaOBacillus subtilis complete genome (section 8 of 21)similar to cell-division protein
Contig329D	24484828_c3_172	574	3411	552	184	169	7.60E-13	Methanobacteri um thermoautotrop hicum	g2621742	MTH659epoxidaseMethanobacterium thermoautotrophicum from bases 587310 to 597778(section 52 of 148) of the complete genome.Function Code
Contig329D	24485950_c1_122	575	3412	537	179					
Contig329D	24610885_f3_69	576	3413	423	141					
Contig329D	24642042_c1_131	577	3414	228	76	118	1.90E-07	Bacillus subtilis	e334782	ylbN'YlbN proteinBacillus subtilis genomic DNA 23.9kB fragment.

Contig329D	24643836_c3_168	578	3415	633	211	227	5.40E-19	Bacillus subtilis	g1377834	ykrCunknownBacillus subtilis ampS-nprE gene region.similar to Orf5 encoded by GenBank Accession
Contig329D	24652178_c3_180	579	3416	477	159	174	2.20E-13	Bacillus subtilis	e1185386	yo2Bconserved hypothetical protein yo2BBacillus subtilis complete genome (section 11 of 21)similar to hypothetical proteins
Contig329D	24730340_c3_167	580	3417	672	224	731	2.10E-72	Bacillus subtilis	P39760	ykbBorf4Bacillus subtilis genes for ampS, mreBH, orf1, kinC, orf3, orf4 andorf5.similar to product of orf4 encoded by GenBank
Contig329D	24801713_c1_118	581	3418	1314	438	1906	6.50E-197	Staphylococcus aureus	Q59821	pdhCdihydroliipoamide acetyltransferaseS.aureus pdhB, pdhC and pdhD genes for pyruvate decarboxylase,dihydroliipoamide acetyltransferase and dihydroliipoamidedehydrogenase.dihydroliipoamide acetyltransferase
Contig329D	24851577_c2_156	582	3419	564	188	405	7.50E-38	Bacillus subtilis	e334776	yibHYIbH proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to hypothetical proteins
Contig329D	25509640_f1_22	583	3420	240	80					
Contig329D	25604677_c3_181	584	3421	450	150	322	4.70E-29	Bacillus subtilis	e334774	yibFYIbf proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to hypothetical proteins
Contig329D	25685000_c3_170	585	3422	903	301	1224	1.20E-124	Bacillus subtilis	g143378	pdhBpyruvate decarboxylase (E-1) beta subunitB.subtilis pyruvate dehydrogenase complex genes, complete cds;PAL-related lipoprotein (slp) gene, complete cds, lysinedecarboxylase (cad) gene, partial cds.similar to pyruvate decarboxylase (E-1) beta
Contig329D	25939030_f2_53	586	3423	183	61					
Contig329D	26354550_c3_183	587	3424	192	64					
Contig329D	26828187_f3_74	588	3425	504	168	187	9.40E-15	Bacillus subtilis	e1185072	yiaLhypothetical protein yiaLBacillus subtilis complete genome (section 8 of 21)
Contig329D	2868785_f1_28	589	3426	339	113	99	8.50E-05	Vigna unguiculata	S54157	extensin-like protein

Contig329D	29319086_c3_182	590	3427	519	173	467	2.00E-44	Bacillus subtilis	e334777	yblY1bl proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to lipopolysaccharide core biosynthesis
Contig329D	29384818_c3_179	591	3428	3465	1155	3900	0	Bacillus subtilis	e1185076	pycApyruvate carboxylaseBacillus subtilis complete genome (section 8 of 21)alternate gene name
Contig329D	30663955_c2_136	592	3429	1152	384	767	3.30E-76	Bacillus subtilis	P12045	purKphosphoribosylaminoimidazole carboxylase IIB.subtilis pur operon encoding purine biosynthesis enzymes, 12genes.phosphoribosylaminoimidazole carboxylase carbon dioxide-fixation chainphosphoribosyl aminoimidazole carboxylase II
Contig329D	30745680_f2_67	593	3430	2007	669	2279	1.90E-236	Bacillus subtilis	P34956	QOXBquinol oxidaseBacillus subtilis AA3-600 quinol oxidase (QOXA, QOXB, QOXC, QOXD)genes, complete cds.cytochrome-c oxidase chain Ialternate gene name
Contig329D	32242890_f2_51	594	3431	1701	567	1986	2.20E-205	Bacillus subtilis	Q45493	ykqCunknownBacillus subtilis ampS-nprE gene region.similar aminopeptidase AMPS with Swiss-Prot
Contig329D	32756_f2_44	595	3432	1401	467	748	3.40E-74	Oryza sativa	g2231132	OsNramp1 integral membrane proteinOryza Sativa integral membrane protein (OsNramp) mRNA.putative
Contig329D	33153_c3_173	596	3433	900	300	451	1.00E-42	Borrelia burgdorferi	g2688563	BB0641 spermidine/putrescine ABC transporter, permeaseBorrelia burgdorferi (section 51 of 70) of the complete genome.similar to GB
Contig329D	33594187_c2_151	597	3434	303	101	150	5.90E-10	Lactobacillus rhamnosus	g2668605	unknownLactobacillus rhamnosus 6-phospho-beta-glucosidase homolog gene,partial cds; GNTR transcriptional regulator homolog and surface located protein genes, complete cds.3.0E-ORF-1

Contig329D	34175686_c1_109	598	3435	513	171	502	3.90E-48	Bacillus subtilis	P12044	purEphosphoribosylaminoimidazole carboxylase IB.subtilis pur operon encoding purine biosynthesis enzymes, 12genes.phosphoribosylaminoimidazole carboxylase catalytic chainphosphoribosyl aminoimidazole carboxylase I
Contig329D	35272200_f2_49	599	3436	222	74	94	6.70E-05	Saccharomyces cerevisiae	g791116	ODP2unknownS.cerevisiae PMS1, TPM1, MKSI, YMK1, MSK1, ODP2, YL9A & FKH2 genes.N2375, len
Contig329D	35947191_c3_174	600	3437	1155	385	149	5.30E-07	Kaposi's sarcoma- associated herpes-like virus	g1633572	Kaposi's sarcoma-associated herpes-like virus ORF73 homolog gene,complete cds.Herpessvirus saimiri ORF73 homolog
Contig329D	36129451_c1_115	601	3438	288	96	408	3.60E-38	Staphylococcus carnosus	P23534	ptSHistidine-containing protein (HPr)S.carnosus ptSH gene for histidine- containing protein (HPr).phosphotransferase system phosphohistidine-containing protein
Contig329D	36142817_c2_148	602	3439	1149	383	925	5.90E-93	Borrelia burgdorferi	g2688562	BB0642spermidine/putrescine ABC transporter,Borrelia burgdorferi (section 51 of 70) of the complete genome.similar to GB
Contig329D	36219187_c3_159	603	3440	2208	736	2062	1.90E-213	Bacillus subtilis	P12042	purQphosphoribosylformylglycinamide synthetase IB.subtilis pur operon encoding purine biosynthesis enzymes, 12genes.phosphoribosylformylglycinamidi ne synthase component IIphosphoribosylformyl glycinamide synthetase II
Contig329D	36601687_c1_111	604	3441	1260	420	1016	1.30E-102	Bacillus subtilis	P12039	purDphosphoribosylglycinamide synthetaseBacillus subtilis phosphoribosylaminoimidazole- carboxamideformyltransferase (purH-J) gene, partial cds,phosphoribosylglycinamide synthetase (purD), YecA (yecA), putativeadenine deaminase (yecB), YecC (yecC), and Yec

Contig329D	3945257_f3_101	605	3442	1176	392	738	3.80E-73	Bacillus subtilis	e1186316	qxAcytochrome aa3 quinol oxidase (subunit II)Bacillus subtilis complete genome (section 20 of 21)alternate gene name
Contig329D	4103438_c2_155	606	3443	255	85	110	1.40E-06	Bacillus subtilis	e334775	yIbGYIbG proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to hypothetical proteins
Contig329D	4300332_c1_114	607	3444	1329	443			Bacillus subtilis	g1377843	yktCunknownBacillus subtilis ampS-nprE gene region.similar to E.coli extragenic suppressor protein
Contig329D	4741010_c1_125	608	3445	846	282	650	8.10E-64	Bacillus subtilis	g1377833	ykrBunknownBacillus subtilis ampS-nprE gene region.similar to polypeptide deformylase from Mycoplasma
Contig329D	4876542_f1_20	609	3446	633	211	551	2.50E-53	Bacillus subtilis	g1377833	yIbMYIbM proteinBacillus subtilis genomic DNA 23.9kB fragment.similar to hypothetical proteins
Contig329D	4899187_f1_1	610	3447	1149	383	402	1.60E-37	Bacillus subtilis	e334781	yIhBYhBBacillus subtilis rrmB-dnaB genomic region.similarity to NADH dehydrogenases
Contig329D	5117162_c2_144	611	3448	1023	341	517	1.00E-49	Bacillus subtilis	g2293292	yhdWhypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to glycerophosphodiester phosphodiesterase
Contig329D	5157963_f1_4	612	3449	939	313	219	3.10E-22	Bacillus subtilis	e1182963	yIaNhypothetical protein yIaNBacillus subtilis complete genome (section 8 of 21)
Contig329D	5974138_f3_77	613	3450	204	68			Bacillus subtilis	e1185074	ykoDYkoDBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.homologous to cobalt transport ATP binding protein
Contig329D	6023593_c2_152	614	3451	288	96	296	2.60E-26	Bacillus subtilis	e1185074	yIhAYhABacillus subtilis rrmB-dnaB genomic region.similarity to cytochrome oxidase D subunit I
Contig329D	6115700_f3_93	615	3452	1404	468	356	6.50E-64	Bacillus subtilis	e1181522	yktAunknownBacillus subtilis ampS-nprE gene region.
Contig329D	632762_f3_104	616	3453	222	74			Bacillus subtilis	g2293293	
Contig329D	6720452_c3_166	617	3454	1356	452	879	4.40E-88	Bacillus subtilis	g2293293	
Contig329D	6834687_c3_171	618	3455	309	103	209	4.40E-17	Bacillus subtilis	g1377841	

Contig329D	7320465_c2_149	619	3456	831	277	525	1.40E-50	Borrelia burgdorferi	g2688564	BB0640spermidine/putrescine ABC transporter, permeaseBorrelia burgdorferi (section 51 of 70) of the complete genome.similar to GB
Contig329D	867176_c3_161	620	3457	1512	504	1090	1.90E-110	Aquifex aeolicus	g2984204	purHphosphoribosylaminimidazolecarboxamideAquifex aeolicus section 97 of 109 of the complete genome.
Contig329D	968785_f1_8	621	3458	939	313	749	2.60E-74	Bacillus stearothermophilus	d1011770	ctaAhome O oxygenaseBacillus stearothermophilus genes for heme O oxygenase and synthetase and cytochrome c subunits II, I, III and IV, completecds.
Contig329D	9925910_c2_140	622	3459	597	199	430	1.70E-40	Bacillus subtilis	P12040	purNphosphoribosylglycinamide formyltransferaseB.subtilis pur operon encoding purine biosynthesis enzymes, 12 genes.phosphoribosylglycinamide formyltransferasephosphoribosylglycinamide formyltransferase
Contig329D	9933463_c3_164	623	3460	1188	396	897	5.40E-90	Bacillus subtilis	P39587	ipa-19conserved hypothetical protein ywbDB.subtilis genomic region (325 to 333).alternate gene name
Contig333D	10553125_f2_90	624	3461	810	270	335	1.30E-31	Gallus gallus	g211700	type X collagenChicken type X collagen gene.
Contig333D	10665903_c2_226	625	3462	378	126	151	4.90E-10	Escherichia coli	P37349	ycgChypothetical protein in treA 5'regionEscherichia coli K-12 MG1655 section 108 of 400 of the completegenome.f473; 100 pct identical to fragment YCGC_ECOLI SW
Contig333D	10828312_f3_133	626	3463	1617	539	272	9.80E-21	Bacillus subtilis	e1182674	yesMtwo-component sensor histidine kinase [Yes homolog yesMBacillus subtilis complete genome (section 4 of 21)similar to two-component sensor histidine kinase
Contig333D	1182765_c1_189	627	3464	7215	2405	2909	0	Bacillus licheniformis	g2982196	bacCbacitracin synthetase 3Bacillus licheniformis bacitracin synthetase operon includingbacitracin synthetase 1 (bacA), 2 (bacB) and 3 (bacC) genes,complete cds.peptide synthetase; BA3; BacC

Contig333D	11895058_c2_206	628	3465	939	313	164	4.20E-10	Enterococcus faecalis	g43338	sprEStaphylococcal serine proteinase homologueE.faecalis sprE gene for serine proteinase homologue.
Contig333D	12554627_c1_161	629	3466	216	72					
Contig333D	1367200_f1_55	630	3467	624	208					
Contig333D	1367202_c2_224	631	3468	963	321	516	9.30E-61	Escherichia coli	g1787450	hypothetical protein b1200Escherichia coli K-12 MG1655 section 108 of 400 of the complete genome.f366; 35 pct identical (32 gaps) to 355 residues
Contig333D	1367340_c2_193	632	3469	843	281	250	8.20E-31	Streptococcus pyogenes	e187587	oppDoligopeptidaseS.pyogenes DNA for oppA, oppB, oppC, oppD, oppF, and dacA genes.
Contig333D	13707008_f2_73	633	3470	231	77					
Contig333D	1385962_c1_185	634	3471	984	328	1016	1.30E-102	Bacillus subtilis	P33557	bioBbiotin synthaseBacillus subtilis rmb-dnaB genomic region.
Contig333D	1411400_f1_37	635	3472	390	130	131	8.10E-09	Caenorhabditis elegans	g1051338	T04F8.8Caenorhabditis elegans cosmid T04F8, complete sequence.cDNA EST yk121f1.5 comes from this gene
Contig333D	14492327_c2_222	636	3473	429	143	495	2.20E-47	Staphylococcus epidermidis	Q03377	fosBfosfomycin resistance protein BS.epidermidis plasmid pIP1842 fosB gene for FOSE.
Contig333D	14895212_c1_168	637	3474	822	274	510	5.60E-49	Bacillus subtilis	g143607	spo0KDsporulation proteinBacillus subtilis spo0K operon.
Contig333D	157625_c2_196	638	3475	930	310					
Contig333D	162550_c1_174	639	3476	198	66					
Contig333D	162578_c2_194	640	3477	984	328	338	9.40E-31	Bacillus subtilis	e1181925	ykuTYkuT proteinBacillus subtilis 29kB DNA fragment from ykwC gene to cse15 gene.similar to hypothetical proteins
Contig333D	165902_c1_190	641	3478	627	209	185	1.50E-14	Bacillus subtilis	P39144	lpa-14lipopeptide antibiotics iturin AB. subtilis lpa-14 gene encoding lipopeptide antibiotics iturin A.
Contig333D	187561_c2_215	642	3479	879	293					
Contig333D	194010_c1_150	643	3480	1512	504	1102	1.00E-111	Corynebacterium glutamicum	e1286985	mqoL-malate dehydrogenase (acceptor)Corynebacterium glutamicum DNA for L-Malate
Contig333D	19773387_f2_88	644	3481	1248	416					



Contig333D	20585963_f2_97	645	3482	897	299	657	1.50E-64	Bacillus anthracis	g929972	Bacillus anthracis Weybridge A toxin plasmid pXO1 right inverted repeat element (WeyAR) bordering the toxin-encoding region, ORFA and ORFB genes, complete cds. ORFB; similar to B. anthracis SterneL element ORFB;
Contig333D	20704012_f3_135	646	3483	240	80					
Contig333D	207876_f3_130	647	3484	513	171	113	3.20E-05	Mus musculus	d1000902	Mouse putative primordial protein transcript, open reading frame (251 AA)
Contig333D	20979688_c3_231	648	3485	786	262	369	4.90E-34	Escherichia coli	P33592	nikCNikCEscherichia coli K-12 MG1655 section 313 of 400 of the complete genome. o277
Contig333D	212827_f2_62	649	3486	1482	494	429	2.10E-40	Bacillus subtilis	e1185986	yubD multidrug resistance protein homolog yubDBacillus subtilis complete genome (section 16 of 21) similar to multidrug resistance protein
Contig333D	22042337_c3_255	650	3487	1434	478	981	6.80E-99	Bacillus subtilis	e1182351	ycnBhomologue of multidrug resistance protein B, Bacillus subtilis complete genome (section 3 of 21) similar to multidrug resistance protein
Contig333D	22664140_f2_87	651	3488	1395	465	191	8.30E-12	Archaeoglobus fulgidus	g2650395	AF0246iron (II) transporter (feoB-1) Archaeoglobus fulgidus section 18 of 172 of the complete genome. similar to GB
Contig333D	22664550_c3_232	652	3489	663	221	275	4.40E-24	Escherichia coli	g1789891	nikEnikE protein Escherichia coli K-12 MG1655 section 313 of 400 of the complete genome. unassigned ATP-binding cassette protein so268
Contig333D	22853432_c2_207	653	3490	384	128	152	2.00E-10	Sus scrofa	P18175	IVLinvolutinPig involutin gene, complete cds. involutin involutin
Contig333D	23444425_c2_195	654	3491	846	282	362	2.70E-33	Bacillus subtilis	e1183056	yhjK hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hypothetical proteins

Contig333D	23470290_c3_243	655	3492	915	305	496	1.70E-47	Bacillus firmus	g1813497	dppC dipeptide transporter protein dppCBacillus firmus dppABC operon, dipeptide transporter protein dppA gene, partial cds, and dipeptide transporter proteins dppB and dppC genes, complete cds.
Contig333D	235837_c2_216	656	3493	1425	475					
Contig333D	23601510_c2_223	657	3494	1137	379	911	1.80E-91	Bacillus stearothermophilus	P32816	gld glycerol dehydrogenase Bacillus stearothermophilus glycerol dehydrogenase (proposed gld) gene, complete cds. lactaldehyde reductase
Contig333D	23647750_f2_81	658	3495	201	67					
Contig333D	23860307_c1_170	659	3496	1218	406	260	1.80E-20	Synechocystis sp.	d1018569	norA quinolone resistance protein NorA Synechocystis sp. PCC6803 complete genome, 11/27, 1311235- 1430418. ORF ID
Contig333D	24000275_f2_64	660	3497	1026	342	1033	2.10E-104	Haemophilus influenzae	P44770	H10596 ornithine carbamoyltransferase (arcB) Haemophilus influenzae from bases 614291 to 624841 (section 56 of 163) of the complete genome. ornithine carbamoyltransferase similar to GB
Contig333D	24105393_c3_247	661	3498	768	256	648	1.30E-63	Streptococcus mutans	g2952528	pflC pyruvate-formate lyase activating enzyme Streptococcus mutans YtqB (ytqB) gene, partial cds; ABC transporter (abcX), putative permease (perM), putative hemolysin (hlyX), pyruvate-formate lyase activating enzyme (pflC), D-alanine-D- alanine carrier protein I
Contig333D	24225375_c3_236	662	3499	213	71	97	3.20E-05	Staphylococcus epidermidis	g3212079	phenol soluble modulins beta 1 Staphylococcus epidermidis phenol soluble modulins beta 1 and phenol soluble modulins beta 2 genes, complete cds. PSM beta 1
Contig333D	24407677_f2_61	663	3500	234	78					
Contig333D	24650300_c2_219	664	3501	1365	455	1037	8.00E-105	Lactobacillus delbrueckii	P34104	brnQ branched-chain amino acid carrier L. delbrueckii brnQ gene for branched-chain amino acid carrier.
Contig333D	24664012_f1_25	665	3502	453	151					

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Contig333D	26760076_f2_65	677	3514	1578	526	1550	3.50E-159	Haemophilus influenzae	P44023	HI0594H. influenzae predicted coding region HI0594Haemophilus influenzae from bases 614291 to 624841 (section 56 of 163) of the complete genome identified by GeneMark; putative. E. Koonin
Contig333D	272593_c1_165	678	3515	879	293					
Contig333D	2928437_c2_220	679	3516	921	307	375	1.10E-34	Archaeoglobus fulgidus	g2649377	AF1210 conserved hypothetical protein Archaeoglobus fulgidus section 86 of 172 of the complete genome similar to GP
Contig333D	2929718_c2_211	680	3517	1959	653	1384	1.30E-141	Staphylococcus aureus	P10335	GEHtriacylglycerol lipase, S. aureus gene encoding lipase (glycerol ester hydrolase). lipase precursor (geh; EC 3.1.1.3)
Contig333D	3003137_f1_31	681	3518	906	302	294	4.30E-26	Aquifex aeolicus	g2982874	cobWcobalamin synthesis related protein CobW Aquifex aeolicus section 7 of 109 of the complete genome.
Contig333D	30271882_c1_155	682	3519	720	240	268	2.50E-23	unidentified	g490316	bioDSynthetic (LORF1) bioD gene.
Contig333D	30351677_c1_147	683	3520	804	268					
Contig333D	30742307_c3_250	684	3521	669	223	640	9.30E-63	Bacillus subtilis	g2271392	opuCDtransmembrane protein Bacillus subtilis osmoprotectant transport system OpuC including ATPase (opuCA), transmembrane protein (opuCB), osmoprotectant binding protein precursor (opuCC) and transmembrane protein (opuCD) genes, complete cds. OpuCD; part of th
Contig333D	3163552_c1_146	685	3522	963	321	326	1.80E-29	Pyrococcus horikoshii	d1027921	PHCH021323aa long hypothetical oligopeptide transport Pyrococcus horikoshii OT3 genomic DNA, 695940-732858 nt position, clones similar to Swiss_Prot
Contig333D	3174187_f1_35	686	3523	330	110					
Contig333D	32615677_c3_239	687	3524	1035	345	510	5.60E-49	Bacillus subtilis	d1023108	ycdHYcdHBacillus subtilis genomic DNA, 22 to 25 degree region, complete cds. homologue of adhesion protein precursor of
Contig333D	32755_f1_22	688	3525	195	65					

Contig333D	33479716_c1_163	689	3526	1401	467	409	2.80E-38	Mycobacterium tuberculosis	e264148	MTCY3G12.01 unknown Mycobacterium tuberculosis cosmid SCY03G12.MTCY3G12.01, len
Contig333D	34429837_f3_113	690	3527	948	316	769	2.00E-76	Escherichia coli	Q46807	YQE Ahypothetical protein b2874 Escherichia coli K-12 MG1655 section 260 of 400 of the complete genome. carbamate kinase 310; This 310 aa ORF is 45 pct identical (21 gaps)
Contig333D	34631527_f3_136	691	3528	336	112	304	3.80E-27	Bacillus anthracis	g929968	Bacillus anthracis Sterne toxin plasmid pXO1 right inverted repeat element (SterneR) bordering the toxin-encoding region, ORFA and truncated ORFB genes, complete cds. ORFA; similar to B. anthracis WeyAR element ORFA;
Contig333D	34642135_c1_183	692	3529	246	82					
Contig333D	34657677_c1_154	693	3530	3552	1184	423	1.70E-38	Bombyx mori	g457769	Collagen B. mori mRNA for collagen.unassigned collagens
Contig333D	35312766_f1_5	694	3531	195	65					
Contig333D	35331905_c1_153	695	3532	318	106					
Contig333D	36135752_f3_128	696	3533	1128	376	172	1.40E-10	Bacillus subtilis	P50736	ypdA thioredoxin reductase homolog ypdA Bacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA, ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH, glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortex lytic enzyme (sleB), ypeB, ypfA, y
Contig333D	36601703_c2_213	697	3534	939	313	294	4.30E-26	Escherichia coli	P33944	yojL yojL protein Escherichia coli K-12 MG1655 section 200 of 400 of the complete genome. f351; Residues 1-121 are 100 pct identical to



Contig333D	4773518_c1_184	709	3546	885	295	563	1.30E-54	Streptococcus equisimilis	e312302	lppCcytoplasmic membrane lipoproteinS.equisimilis gapC and lppC genes.
Contig333D	4782963_c2_209	710	3547	1365	455	1105	5.00E-112	Aquifex aeolicus	g2982887	bioADAPA aminotransferaseAquifex aeolicus section 8 of 109 of the complete genome.
Contig333D	4797177_c3_248	711	3548	588	196	308	1.40E-27	Synechocystis sp.	d1011096	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 22/27, 2755703-2868766. ORF ID
Contig333D	4798202_c1_159	712	3549	816	272					
Contig333D	4859628_c1_148	713	3550	195	65					
Contig333D	4867842_c1_175	714	3551	978	326	486	1.90E-46	Archaeoglobus fulgidus	g2649379	AF12063-hydroxyacyl-CoA dehydrogenase (hbd-8)Archaeoglobus fulgidus section 86 of 172 of the complete genome.similar to PID
Contig333D	4884812_f2_70	715	3552	1257	419	292	7.00E-26	Escherichia coli	P23908	argEacetylornithine deacetylaseEscherichia coli K-12 MG1655 section 360 of 400 of the completegenome.f383; 100 pct identical to ARGE_ECOLI SW
Contig333D	4895061_c3_246	716	3553	2271	757	2671	5.60E-278	Escherichia coli	P09373	pfIFormate C-acetyltransferaseEscherichia coli genomic DNA. (20.3 - 20.7 min).f760; 100 pct identical to PFLB_ECOLI SW
Contig333D	4974091_c3_249	717	3554	504	168					
Contig333D	5109785_c1_187	718	3555	255	85					
Contig333D	5113413_c1_176	719	3556	642	214	579	2.70E-56	Bacillus subtilis	g2271390	opuCBtransmembrane proteinBacillus subtilis osmoprotectant transport system OpuC includingATPase (opuCA), transmembrane protein (opuCB), osmoprotectantbinding protein precursor (opuCC) and transmembrane protein (opuCD)genes, complete cds.OpuCB; part of th
Contig333D	5160925_c2_205	720	3557	192	64					
Contig333D	5189037_c1_156	721	3558	711	237	351	3.90E-32	Methanococcus jannaschii	g1591935	MJ12976-carboxyhexanoate-CoA ligase (bioW)Methanococcus jannaschii section 112 of 150 of the complete genome.similar to GB

Contig333D	6056567_c2_225	722	3559	579	193	320	7.60E-29	Escherichia coli	g1787449	hypothetical protein b1199Escherichia coli K-12 MG1655 section 108 of 400 of the complete genome.f210; 30 pct identical (16 gaps) to 181 residues
Contig333D	625262_c2_198	723	3560	228	76					
Contig333D	6302217_c1_167	724	3561	948	316	541	2.90E-52	Escherichia coli	g1789888	nikNickel transport system permease protein nikB Escherichia coli K-12 MG1655 section 313 of 400 of the complete genome.o314; 99 pct identical amino acid sequence and
Contig333D	7072825_c2_202	725	3562	774	258	446	3.40E-42	Candida albicans	P87219	SOU1Sou1pCandida albicans Sou2p (SOU2), Sou1p (SOU1) and Vma8p (VMA8) genes,complete cds.short-chain alcohol dehydrogenase homolog
Contig333D	800300_c2_208	726	3563	585	195	313	4.20E-28	Saimiri sciureus	e256400	anti-P.falci parum antigenic polypeptideDNA encoding anti-P.falci parum antigenic polypeptide.
Contig333D	814140_c2_204	727	3564	1422	474	1168	1.00E-118	Escherichia coli	P13408	uhpThexosephosphate transport proteinEscherichia coli K-12 MG1655 section 334 of 400 of the complete genome.hexose phosphate transport protein uhpTf463; 99 pct identical amino acid sequence and
Contig333D	816878_c1_166	728	3565	1632	544	840	6.00E-84	Escherichia coli	P33590	nikAnickel-binding periplasmic protein precursorEscherichia coli K-12 MG1655 section 313 of 400 of the complete genome.dipeptide transport proteino524; 100 pct identical amino acid sequence and
Contig333D	822150_f1_54	729	3566	516	172					
Contig333D	875765_c3_235	730	3567	210	70					
Contig333D	969157_c2_191	731	3568	1026	342	203	9.30E-14	Escherichia coli	P33590	nikAnickel-binding periplasmic protein precursorEscherichia coli K-12 MG1655 section 313 of 400 of the complete genome.dipeptide transport proteino524; 100 pct identical amino acid sequence and



Contig333D	9806718_c2_218	732	3569	762	254	417	4.00E-39	Escherichia coli	P37313	dppF dipeptide transport ATP-binding protein dppF Escherichia coli K-12 MG1655 section 321 of 400 of the complete genome. inner membrane protein malK f334; 100 pct identical amino acid sequence and
Contig333D	984686_c2_221	733	3570	1221	407	1172	3.90E-119	Bacillus subtilis	g2271389	opuCAA TPase Bacillus subtilis osmoprotectant transport system OpuC including ATPase (opuCA), transmembrane protein (opuCB), osmoprotectant binding protein precursor (opuCC) and transmembrane protein (opuCD) genes, complete cds. OpuCA; part of the osmoprotectan
Contig333D	9970167_f2_96	734	3571	861	287	219	2.40E-25	Bacillus subtilis	e1182675	yesN two-component response regulator [YesM] Bacillus subtilis complete genome (section 4 of 21) similar to two-component response regulator [YesM]
Contig334D	1017_f1_54	735	3572	255	85					
Contig334D	10666068_c3_256	736	3573	330	110	196	1.00E-15	Bacillus subtilis	P25955	comG3ComGCBacillus subtilis (clone pED4) com G-(1,2,3,4,5,6, and 7) proteins in comG operon, complete cds.
Contig334D	10969050_c2_201	737	3574	1596	532	1815	2.90E-187	Bacillus subtilis	P37949	lepAYqeQBacillus subtilis DNA, 283 Kb region containing skin element. alternate gene name
Contig334D	10970258_f3_122	738	3575	1011	337	1197	8.80E-122	Bacillus subtilis	e1183983	yrvN conserved hypothetical protein yrvNBacillus subtilis complete genome (section 14 of 21) similar to hypothetical proteins
Contig334D	11194067_c3_240	739	3576	747	249	431	1.30E-40	Bacillus subtilis	P54458	yqeMYqeMBacillus subtilis DNA, 283 Kb region containing skin element. similar to hypothetical proteins
Contig334D	11720090_c3_241	740	3577	525	175	588	3.00E-57	Staphylococcus aureus	P45556	HRC AORF37Staphylococcus aureus genes for ORF37; HSP20; HSP70; HSP40; ORF35, complete cds.
Contig334D	1218750_c1_150	741	3578	681	227	336	1.50E-30	Streptococcus pneumoniae	g3211753	celA competence proteinStreptococcus pneumoniae competence protein (celA) and competence protein (celB) genes, complete cds; and unknown gene.

Contig334D	136068_f3_99	742	3579	1404	468	1201	3.30E-122	Mycobacterium tuberculosis	e315164	glySGlySMycobacterium tuberculosis cosmid Y27.MTCY27.23, glyS, len
Contig334D	14259631_c1_135	743	3580	1068	356	1207	7.70E-123	Bacillus subtilis	e1184021	queAS-adenosylmethionine tRNA ribosyltransferaseBacillus subtilis complete genome (section 15 of 21)
Contig334D	14508567_c3_230	744	3581	276	92	184	2.00E-14	Bacillus subtilis	e1184019	yrbF conserved hypothetical protein yrbFBacillus subtilis complete genome (section 15 of 21) similar to hypothetical proteins
Contig334D	14881687_c3_254	745	3582	993	331	1448	2.20E-148	Staphylococcus xylosum	g666116	glkA glucose kinaseS.xylosum glucose kinase gene.
Contig334D	15728386_c3_229	746	3583	1143	381	1542	2.40E-158	Bacillus subtilis	e1184020	tgtrRNA-guanine transglycosylaseBacillus subtilis complete genome (section 15 of 21)
Contig334D	16828175_c1_163	747	3584	606	202	800	1.00E-79	Bacillus subtilis	d1013186	sodA YqgDBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	189203_c3_243	748	3585	762	254	550	3.20E-53	Bacillus subtilis	P54461	yqeUYqeUBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	19540931_c2_199	749	3586	2220	740	647	1.70E-63	Bacillus subtilis	P39695	COMEHypothetical protein 3 (comE operon)Bacillus subtilis comE operon encoding ORF1, ORF2, ORF3 andReverse ORF genes, complete cds.
Contig334D	20006377_c1_160	750	3587	732	244	432	1.00E-40	Bacillus subtilis	P54471	yqfNYqfNBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	20791068_c3_235	751	3588	273	91					
Contig334D	21667676_c1_139	752	3589	888	296	590	1.90E-57	Bacillus subtilis	e1184002	yrvM conserved hypothetical protein yrvMBacillus subtilis complete genome (section 15 of 21) similar to hypothetical proteins
Contig334D	21759427_c1_170	753	3590	1350	450	1396	7.20E-143	Bacillus subtilis	P54376	yqhYqhbBacillus subtilis DNA, 283 Kb region containing skin element.similar to glycine dehydrogenase

Contig334D	2195307_c1_167	754	3591	1095	365	348	8.20E-32	Bacillus subtilis	P25954	comG2ComGBBacillus subtilis (clone pED4) comG-(1,2,3,4,5,6, and 7) proteins in comG operon, complete cds.
Contig334D	2227312_c1_138	755	3592	1782	594	2019	6.90E-209	Bacillus subtilis	e1184003	aspSasparyl-tRNA synthetaseBacillus subtilis complete genome (section 15 of 21)
Contig334D	23470327_c3_253	756	3593	1461	487	446	3.40E-42	Staphylococcus xylosus	g666115	ughypothetical protein 1S.xylosus glucose kinase gene.orf1 upstream of glucose kinase
Contig334D	23470452_c2_193	757	3594	441	147	209	4.40E-17	Aquifex aeolicus	g2983771	accBbiotin carboxyl carrier proteinAquifex aeolicus section 68 of 109 of the complete genome.
Contig334D	23476676_c3_246	758	3595	369	123	227	5.40E-19	Bacillus subtilis	g902055	dgkdiacylglycerol kinaseBacillus subtilis PhoH (phoH) gene, partial cds, diacylglycerolkinase (dgk) gene, complete cds, and cytidine deaminase (cdd) gene,partial cds.
Contig334D	23595137_c2_195	759	3596	558	186	522	3.00E-50	Bacillus subtilis	P54452	yqeGYqeGBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	23642942_c2_209	760	3597	696	232	132	2.10E-06	Caenorhabditis elegans	g1255425	C33G8.2Caenorhabditis elegans cosmid C33G8.
Contig334D	23703452_c2_224	761	3598	1509	503	1808	1.60E-186	Bacillus subtilis	P54377	yqhKYqhKBacillus subtilis DNA, 283 Kb region containing skin element.similar to glycine dehydrogenase
Contig334D	2381885_c1_145	762	3599	1272	424	1066	6.70E-108	Bacillus subtilis	e1182373	ycsGbranched chain amino acids transporter homolog ycsGBacillus subtilis complete genome (section 3 of 21)alternate gene name
Contig334D	23850302_c3_234	763	3600	2694	898	2695	1.60E-280	Bacillus subtilis	e1183970	alaSalanyl-tRNA synthetaseBacillus subtilis complete genome (section 14 of 21)
Contig334D	24042212_c1_168	764	3601	498	166					
Contig334D	24071068_c3_91	765	3602	399	133	308	1.40E-27	Bacillus subtilis	P54510	yqhLYqhLBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins

Contig334D	24094090_c1_144	766	3603	957	319	927	3.60E-93	Bacillus subtilis	e1183965	yrnNproteinase homolog yrrNBacillus subtilis complete genome (section 14 of 21)similar to protease
Contig334D	24229805_c3_238	767	3604	1386	462	1133	5.30E-115	Bacillus subtilis	d1013248	accCYqhXBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	24260061_c3_226	768	3605	348	116	214	1.30E-17	Bacillus subtilis	P26942	ysxBconserved hypothetical protein ysrBB.subtilis spoIVFA, spoIVFB, L20, orfX and L24 genes. ORF X
Contig334D	24275927_f2_76	769	3606	189	63					
Contig334D	24306263_c2_222	770	3607	297	99					
Contig334D	24470317_c2_208	771	3608	1020	340	1246	5.70E-127	Bacillus subtilis	P54466	yqfAYqfABacillus subtilis DNA, 283 Kb region containing skin element.
Contig334D	24486330_c1_142	772	3609	693	231	321	5.90E-29	Bacillus subtilis	e1183978	yrnBconserved hypothetical protein yrrBBacillus subtilis complete genome (section 14 of 21)similar to hypothetical proteins
Contig334D	24610877_c2_223	773	3610	519	173	226	6.90E-19	Lactococcus lactis	P43906	aroKshikimate kinaseL.lactis tyrA, aroA, aroK and pheA genes.shikimate kinase
Contig334D	24640937_c3_257	774	3611	498	166					
Contig334D	24658562_f3_121	775	3612	276	92	233	4.00E-19	Bacillus subtilis	e1183983	yrnNconserved hypothetical protein yrrNBacillus subtilis complete genome (section 14 of 21)similar to hypothetical proteins
Contig334D	24823311_c1_169	776	3613	210	70					
Contig334D	24886587_c2_186	777	3614	2448	816	1981	1.90E-207	Bacillus subtilis	e1183977	yrnCconjugation transfer protein homolog yrrCBacillus subtilis complete genome (section 14 of 21)similar to conjugation transfer protein
Contig334D	25413126_f2_62	778	3615	189	63					
Contig334D	2542188_c2_218	779	3616	270	90					
Contig334D	25502217_c2_176	780	3617	615	205	410	2.20E-38	Bacillus subtilis	e1184023	ruvAHoliday junction DNA helicaseBacillus subtilis complete genome (section 15 of 21)
Contig334D	25595186_c2_188	781	3618	651	217	736	6.30E-73	Bacillus subtilis	e1183963	udkuridine kinaseBacillus subtilis complete genome (section 14 of 21)

Contig334D	25672337_c2_213	782	3619	780	260	367	7.90E-34	Bacillus subtilis	P42095	yqxNYqfBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	25680218_c3_244	783	3620	726	242	425	5.70E-40	Bacillus subtilis	P54465	yqeZYqeZBacillus subtilis DNA, 283 Kb region containing skin element.
Contig334D	26203942_c1_158	784	3621	630	210	636	2.50E-62	Bacillus subtilis	e1185791	yqzBconserved hypothetical protein (section 13 of 21)similar to hypothetical proteins
Contig334D	26209425_c2_216	785	3622	1068	356	1672	4.10E-172	Staphylococcus aureus	P26766	plaSigma factorS.aureus sigma factor (plaC) gene, complete cds.transcription initiation factor sigma 43
Contig334D	26212501_c1_162	786	3623	852	284	454	4.80E-43	Bacillus subtilis	d1023110	yceAYceABacillus subtilis genomic DNA, 22 to 25 degree region, completecds.homologue of a hypothetical 32.8 kDa protein in
Contig334D	26251577_c1_149	787	3624	354	118	372	2.30E-34	Bacillus subtilis	P54457	yqeLYqeLBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	26734750_c2_185	788	3625	1164	388	895	8.90E-90	Bacillus subtilis	e1183981	yrvONifS protein homolog homolog yrvOBacillus subtilis complete genome (section 14 of 21)similar to NifS protein homolog
Contig334D	26772135_c1_151	789	3626	996	332	555	9.50E-54	Bacillus subtilis	P54459	yqeNYqeNBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	29468751_c1_172	790	3627	1173	391	855	1.50E-85	Bacillus subtilis	P54518	yqhTYqhTBacillus subtilis DNA, 283 Kb region containing skin element.similar to Xaa-Pro dipeptidase
Contig334D	29494055_c2_206	791	3628	942	314	1248	3.50E-127	Staphylococcus aureus	P45557	PRMAORF35Staphylococcus aureus genes for ORF37; HSP20; HSP70; HSP40; ORF35,complete cds.
Contig334D	29845127_c2_190	792	3629	636	212	588	3.00E-57	Clostridium perfringens	e303881	putative transposaseC.perfringens uapC, cpe, and nadC genes.
Contig334D	29958512_c3_236	793	3630	372	124	181	4.10E-14	Bacillus subtilis	e1183968	yrzBhypothetical protein yrzBBacillus subtilis complete genome (section 14 of 21)

Contig334D	30366652_c3_232	794	3631	897	299	1137	2.00E-115	Staphylococcus aureus	g2580435	lytH N-acetyl-muramoyl-L-alanine amidase Staphylococcus aureus gene for histidyl-tRNA synthetase, ppGpp hydrolase, lytic enzyme, complete cds. partially similar to the LytC protein of Bacillus
Contig334D	3125378_c2_219	795	3632	2097	699	1425	6.10E-146	Bacillus subtilis	P54488	pbpA YqgF Bacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	31527312_c3_251	796	3633	438	146	700	4.10E-69	Staphylococcus epidermidis	P54204	FurS.epidermidis genes fur and sod (partial).putative
Contig334D	32212_c2_181	797	3634	1317	439	1921	1.70E-198	Staphylococcus aureus	g2580436	hisS histidyl-tRNA synthetase Staphylococcus aureus gene for histidyl-tRNA synthetase, ppGpp hydrolase, lytic enzyme, complete cds.putative; similar to the hisS gene of E.coli
Contig334D	32244050_c2_198	798	3635	465	155	550	3.20E-53	Bacillus subtilis	P32393	comEB ComEB Bacillus subtilis comE operon encoding ORF1, ORF2, ORF3 and Reverse-ORF genes, complete cds.alternate gene name
Contig334D	32422015_c2_215	799	3636	1803	601	2059	4.00E-213	Staphylococcus aureus	O05338	dnaG Staphylococcus aureus DNA for sigma70 operon, complete cds.
Contig334D	32459627_c1_166	800	3637	630	210	403	1.20E-37	Bacillus subtilis	P54501	yqgXY qgX Bacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	33409385_c2_225	801	3638	852	284	917	4.10E-92	Bacillus subtilis	e1185721	yqhM conserved hypothetical protein yqhM Bacillus subtilis complete genome (section 13 of 21) similar to hypothetical proteins from B. subtilis
Contig334D	33711505_c1_147	802	3639	357	119	316	2.00E-28	Bacillus subtilis	P54454	yqelY qel Bacillus subtilis DNA, 283 Kb region containing skin element.similar to dihydrodipicolinate reductase
Contig334D	34002212_c1_143	803	3640	447	149	437	3.00E-41	Bacillus subtilis	e1183969	yrnK conserved hypothetical protein yrnK Bacillus subtilis complete genome (section 14 of 21) similar to hypothetical proteins

Contig334D	34021937_c1_161	804	3641	822	274	432	1.00E-40	Methanobacterium thermoautotrophicum	g2621685	MTH605ABC transporterMethanobacterium thermoautotrophicum from bases 535779 to 549251 (section 48 of 148) of the complete genome.Function Code
Contig334D	34166088_c2_173	805	3642	321	107	382	2.00E-35	Bacillus subtilis	P26908	L20ribosomal protein L21 (BL20)B.subtilis spoIVFA, spoIVFB, L20, orfX and L24 genes.Escherichia coli ribosomal protein L21homolog of E.coli ribosomal protein L21
Contig334D	34181643_c1_146	806	3643	702	234	579	2.70E-56	Escherichia coli	P24247	pfsPfs proteinEscherichia coli K-12 MG1655 section 15 of 400 of the completegenome.f232; 100 pct identical to PFS_ECOLI SW
Contig334D	34376512_f2_80	807	3644	1080	360	814	3.40E-81	Bacillus subtilis	d1020093	yddNconserved hypothetical protein yddNBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.SIMILAR TO ALKANAL MONOOXYGENASE ALPHA CHAIN.
Contig334D	34417217_c2_189	808	3645	492	164	531	3.30E-51	Bacillus subtilis	e1183962	greAtranscription elongation factorBacillus subtilis complete genome (section 14 of 21)
Contig334D	34610925_c2_204	809	3646	1851	617	2792	8.50E-291	Staphylococcus aureus	P45554	DNAKHSP70Staphylococcus aureus genes for ORF37; HSP20; HSP70; HSP40; ORF35, complete cds.
Contig334D	34642127_f2_57	810	3647	237	79					GRPEHSP20Staphylococcus aureus genes for ORF37; HSP20; HSP70; HSP40; ORF35, complete cds.
Contig334D	35319157_c1_154	811	3648	675	225	724	1.20E-71	Staphylococcus aureus	P45553	yrnMcaffoyl-CoA O-methyltransferase homolog yrnMBacillus subtilis complete genome (section 14 of 21)similar to caffoyl-CoA O-methyltransferase
Contig334D	35334680_c2_187	812	3649	699	233	377	6.90E-35	Bacillus subtilis	e1183966	
Contig334D	35343875_c3_228	813	3650	1026	342	1044	1.40E-105	Escherichia coli	P08577	ruvBHolliday junction DNA helicase RuvB.E.coli genomic DNA, Kohara clone #337(41.9-42.3 min.).ruvB proteinORF_ID

Contig334D	35444067_c3_248	814	3651	837	279	1206	9.80E-123	Staphylococcus aureus	d1020251	orf30Staphylococcus aureus DNA for sigma70 operon, complete cds.
Contig334D	35975077_c3_250	815	3652	891	297	1175	1.90E-119	Bacillus subtilis	P54476	yqfSYqfSBacillus subtilis DNA, 283 Kb region containing skin element.similar to endonuclease IV
Contig334D	36125057_c3_249	816	3653	1368	456	1039	4.90E-105	Bacillus subtilis	P54475	yqfRYqfRBacillus subtilis DNA, 283 Kb region containing skin element.similar to ATP-dependent RNA helicase
Contig334D	36225626_c2_180	817	3654	537	179	839	7.60E-84	Staphylococcus aureus	g2580432	aptadenine phosphoribosyltransferaseStaphylococcus aureus gene for histidyl-tRNA synthetase, ppGpphydrolase, lytic enzyme, complete cds.putative; similar to the apt gene of E.coli
Contig334D	36573502_c3_231	818	3655	2211	737	3507	0	Staphylococcus aureus	g2580433	relppGpp hydrolaseStaphylococcus aureus gene for histidyl-tRNA synthetase, ppGpphydrolase, lytic enzyme, complete cds.putative; similar to the relA and spoT genes of
Contig334D	3916011_c2_214	819	3656	207	69					
Contig334D	3916578_c1_137	820	3657	501	167	619	1.60E-60	Staphylococcus aureus	g2580434	Staphylococcus aureus gene for histidyl-tRNA synthetase, ppGpphydrolase, lytic enzyme, complete cds. ORF1
Contig334D	3941262_c1_153	821	3658	465	155	609	1.80E-59	Bacillus subtilis	P37949	lepAYqeQBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	3945937_c2_207	822	3659	1371	457	1764	7.30E-182	Bacillus subtilis	P54462	yqeVYqeVBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	4015702_c2_211	823	3660	468	156	416	5.10E-39	Bacillus subtilis	P46347	yqfGYqfGBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	4023415_f3_125	824	3661	240	80					
Contig334D	41088_c3_255	825	3662	987	329	517	1.00E-49	Bacillus subtilis	P25953	comG1ComGABacillus subtilis (clone pED4) comG-(1,2,3,4,5,6, and 7) proteins incomG operon, complete cds.late competence gene



Contig334D	4152203_c2_174	826	3663	300	100	426	4.40E-40	Bacillus subtilis	P05657	rpmAL27 ribosomal protein subtilis ribosomal protein L27 gene, upstream of spo0B locus, complete cds. Escherichia coli ribosomal protein L27 polypeptide homologous to E. coli ribosomal protein
Contig334D	4172025_c2_191	827	3664	744	248	456	1.30E-45	Bacillus subtilis	P42967	yscL urea amidolyase Bacillus subtilis genome around 39 degrees region encoding 17 ORFs, complete cds. similar to allophanate hydrolase
Contig334D	4176557_c3_237	828	3665	1302	434	1676	1.50E-172	Bacillus subtilis	e1183964	yrpO proteinase homolog Bacillus subtilis complete genome (section 14 of 21) similar to protease
Contig334D	42132_f1_51	829	3666	288	96					
Contig334D	4336693_c1_141	830	3667	1131	377	1158	1.20E-117	Bacillus subtilis	e1183979	yrpA conserved hypothetical protein Bacillus subtilis complete genome (section 14 of 21) similar to hypothetical proteins
Contig334D	4406502_c1_157	831	3668	939	313	1033	2.10E-104	Bacillus subtilis	P42182	bexY qhl Bacillus subtilis DNA, 283 Kb region containing skin element. similar to Era, an essential small G-protein in E.
Contig334D	4459380_c2_178	832	3669	207	69					
Contig334D	4492268_c2_203	833	3670	489	163	614	5.30E-60	Staphylococcus aureus	P45556	HRC AORF37 Staphylococcus aureus genes for ORF37; HSP20; HSP70; HSP40; ORF35, complete cds.
Contig334D	4564137_f1_1	834	3671	633	211	125	2.60E-06	Borrelia burgdorferi	g466482	OspF outer surface protein F Borrelia burgdorferi outer surface protein F (OspF) gene, complete cds. putative
Contig334D	4693812_c3_258	835	3672	1116	372	970	1.00E-97	Bacillus subtilis	P54378	yqhI Y qhl Bacillus subtilis DNA, 283 Kb region containing skin element. similar to aminomethyltransferase
Contig334D	4704678_c1_165	836	3673	210	70	115	4.00E-07	Bacillus subtilis	P54494	yagY qgQ Bacillus subtilis DNA, 283 Kb region containing skin element.
Contig334D	4798143_c3_233	837	3674	432	144	305	2.90E-27	Bacillus subtilis	e1183982	yrzC conserved hypothetical protein Bacillus subtilis complete genome (section 14 of 21) similar to hypothetical proteins
Contig334D	4822177_c2_220	838	3675	330	110	476	2.20E-45	Staphylococcus xylosus	e147899	dglAS xylosus glucose kinase gene. orf2 downstream of glucose kinase

Contig334D	4859677_c2_210	839	3676	939	313	974	3.80E-98	Bacillus subtilis	P46343	phoHYqeBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	4860942_c3_239	840	3677	594	198	356	1.20E-32	Bacillus subtilis	P54455	yqeYqeBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	4884675_c2_217	841	3678	1104	368	612	8.70E-60	Bacillus subtilis	e1185784	yqfOconserved hypothetical protein yqfOBacillus subtilis complete genome (section 13 of 21)similar to hypothetical proteins
Contig334D	4892200_c2_196	842	3679	1101	367	1012	3.50E-102	Bacillus subtilis	P54453	yqeHYqeBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	4892942_c2_194	843	3680	768	256	660	7.10E-65	Bordetella pertussis	g2290993	unknownBordetella pertussis D-3-phosphoglycerate dehydrogenase homolog(serA) and Brg1 (brg1) genes, complete cds.orf7; similar to B. subtilis YcsF
Contig334D	4900381_c2_179	844	3681	2298	766	1335	2.10E-136	Bacillus subtilis	e1184010	yrvEsingle-strand DNA-specific exonuclease homolog yrvEBacillus subtilis complete genome (section 15 of 21)similar to single-strand DNA-specific exonuclease
Contig334D	4939377_c2_175	845	3682	480	160	277	2.70E-24	Bacillus subtilis	P21204	pheBchorismate mutaseBacillus subtilis sporulation protein (spoOB), GTP-binding protein(obg), phenylalanine biosynthesis associated protein (pheB), andmonofunctional prephenate dehydratase (pheA) genes, complete cds.
Contig334D	5078786_c2_182	846	3683	189	63					
Contig334D	5100002_c1_155	847	3684	285	95	268	2.50E-23	Bacillus subtilis	d1013149	rpsUYqeXBacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig334D	5115876_f1_4	848	3685	270	90					
Contig334D	5136062_c2_197	849	3686	825	275	543	1.80E-52	Bacillus subtilis	P54374	aroDAroDBacillus subtilis DNA, 283 Kb region containing skin element.

Contig334D	5269011_c2_192	850	3687	1014	338	491	5.70E-47	Pyrococcus horikoshii	d1028099	PHAF014331aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 886755-916062 nt position, clones similar to Swiss_Prot DNAJHSP40Staphylococcus aureus genes for ORF37, HSP20; HSP70; HSP40; ORF35, complete cds.
Contig334D	5875257_c2_205	851	3688	1158	386	1741	2.00E-179	Staphylococcus aureus	P45555	
Contig334D	6041018_c2_177	852	3689	2301	767	1547	7.20E-159	Bacillus subtilis	e1184013	secFprotein-export membrane proteinBacillus subtilis complete genome (section 15 of 21)
Contig334D	6048177_c2_202	853	3690	1176	392	948	2.10E-95	Bacillus subtilis	d1013140	hemNYqeBacillus subtilis DNA, 283 Kb region containing skin element.alternate
Contig334D	6058468_c2_212	854	3691	417	139	332	4.10E-30	Bacillus subtilis	P19079	gene name cddCddBacillus subtilis DNA, 283 Kb region containing skin element.
Contig334D	6719077_c3_260	855	3692	558	186	700	4.10E-69	Bacillus subtilis	P49778	efpYqhUBacillus subtilis DNA, 283 Kb region containing skin element.alternate
Contig334D	6759838_f1_24	856	3693	264	88	160	6.80E-12	Bacillus subtilis	d1013135	gene name rpsTYqeOBacillus subtilis DNA, 283 Kb region containing skin element.alternate
Contig334D	6925012_c3_227	857	3694	1320	440	1527	9.50E-157	Bacillus subtilis	P20964	gene name obgGTP-binding proteinBacillus subtilis sporulation protein (spoOB), GTP-binding protein(obg), phenylalanine biosynthesis associated protein (pheB), and monofunctional prephenate dehydratase (pheA) genes, complete cds.spoOB 3'-region GTP-binding proteinTh
Contig334D	7273457_c3_252	858	3695	570	190	299	1.30E-26	Streptococcus mutans	d1029655	Streptococcus mutans gene for glucose-1-phosphateuridylyltransferase, complete cds.hypothetical protein
Contig334D	812817_c1_148	859	3696	612	204	367	7.90E-34	Bacillus subtilis	P34456	yqeKYqeKBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins
Contig334D	820452_c1_171	860	3697	270	90	105	1.20E-05	Staphylococcus haemolyticus	g1022725	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds. ORF2
Contig336D	12690706_f1_1	861	3698	231	77					
Contig336D	14552215_f1_2	862	3699	192	64					

Contig336D	14901578_f1_5	863	3700	461	154	323	3.60E-29	Bacillus subtilis	d1020044	ydbOConserved hypothetical protein ydbO Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN, SIMILAR PRODUCT IN B. SUBTILIS
Contig336D	20413202_c3_14	864	3701	1152	384	961	9.00E-97	Escherichia coli	P23524	yhaD hypothetical 42.1 kD protein in mpB-sohA Escherichia coli K-12 MG1655 section 284 of 400 of the complete genome. f408; 100 pct identical amino acid sequence and
Contig336D	23600412_c2_12	865	3702	1242	414	546	8.50E-53	Bacillus subtilis	d1020154	ydgK bicyclomycin resistance protein homolog ydgK Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. SIMILAR TO BICYCLOMYCIN RESISTANCE PROTEIN.
Contig336D	34585317_f3_8	866	3703	1491	497					
Contig336D	4098518_c3_15	867	3704	711	237	121	4.90E-08	Plasmodium falciparum	P04931	Ag319 asparagine-rich protein Plasmodium falciparum asparagine-rich protein (ARP), partial cds.
Contig336D	4392767_f2_6	868	3705	435	145	145	2.70E-10	Actinobacillus actinomycetemcomitans	d1020420	Actinobacillus actinomycetemcomitans DNA for glycosyltransferase, lytic transglycosylase, dTDP-4-rhamnose reductase, complete cds. unnamed protein product
Contig337D	1180328_c3_35	869	3706	816	272	372	2.30E-34	Bacillus subtilis	g2293147	ytxMYtxMBacillus subtilis rnb-dnaB genomic region. similarity with 2-hydroxy-6-oxo-2,4-heptadienoate
Contig337D	11924012_c1_25	870	3707	225	75					
Contig337D	13848387_f2_19	871	3708	240	80	131	8.10E-09	Synechocystis sp.	d1011491	clpP hypothetical protein Synechocystis sp. PCC6803 complete genome, 25/27, 3138604-3270709. ORF_ID
Contig337D	16683437_f1_1	872	3709	1023	341	571	1.90E-55	Bacillus subtilis	e1184942	ykrP conserved hypothetical protein ykrP Bacillus subtilis complete genome (section 8 of 21) similar to hypothetical proteins

Contig337D	20739037_c1_28	873	3710	426	142	690	4.70E-68	Staphylococcus epidermidis	g2267243	putative transcriptional regulator AtIRStaphylococcus epidermidis autolysin AtIE and putativetranscriptional regulator AtIR genes, complete cds.
Contig337D	21524191_c1_24	874	3711	540	180	529	5.40E-51	Staphylococcus haemolyticus	g1022725	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds.ORF2
Contig337D	22703588_f2_16	875	3712	954	318	803	5.00E-80	Bacillus subtilis	P39582	ipa-6dihypothetical proteinB.subtilis genomic region (325 to 333).alternate gene name
Contig337D	23625637_c2_30	876	3713	183	61			Staphylococcus epidermidis		
Contig337D	24072175_f3_20	877	3714	780	260	1321	6.40E-135	Staphylococcus epidermidis	g2267239	Staphylococcus epidermidis autolysin AtIE and putativetranscriptional regulator AtIR genes, complete cds.ORF1
Contig337D	24105342_c1_27	878	3715	831	277	1242	1.50E-126	Bacillus subtilis	g2293148	menBdihydroxynaphthoate synthaseBacillus subtilis rrmB-dnaB genomic region.
Contig337D	24416702_f2_9	879	3716	4008	1336	7001	0	Staphylococcus epidermidis	g2267242	autolysin AtIEStaphylococcus epidermidis autolysin AtIE and putativetranscriptional regulator AtIR genes, complete cds.primary attachment to a polystyrene surface
Contig337D	26775637_c1_26	880	3717	1389	463	599	2.10E-58	Bacillus subtilis	P23973	menFisochorismate synthaseBacillus subtilis rrmB-dnaB genomic region.based on similarity to E. coli EntC, A. hydrophila
Contig337D	33710968_f2_8	881	3718	453	151	742	1.40E-73	Staphylococcus epidermidis	g2267241	Staphylococcus epidermidis autolysin AtIE and putativetranscriptional regulator AtIR genes, complete cds.ORF3
Contig337D	3394540_f2_17	882	3719	312	104					
Contig337D	4181312_c2_31	883	3720	606	202					
Contig337D	5115927_c2_32	884	3721	1680	560	340	1.10E-59	Synechocystis sp.	d1011017	menD2-succinyl-6-hydroxy-2.Synechocystis sp. PCC6803 complete genome, 21/27, 2644795-2755702.ORF_ID

Contig337D	6688757_f2_7	885	3722	507	169	823	3.80E-82	Staphylococcus epidermidis	g2267240	Staphylococcus epidermidis autolysin AtlE and putative transcriptional regulator AtlR genes, complete cds. ORF2
Contig337D	978436_f2_10	886	3723	1188	396	875	1.20E-87	Bacillus subtilis	C33496	hisC homolog
Contig338D	12142768_c3_17	887	3724	300	100	110	3.50E-06	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position, clone
Contig338D	12531558_c2_13	888	3725	351	117					
Contig338D	14849093_f1_1	889	3726	294	98	127	2.10E-08	Mitochondrion Chondrus crispus	e138028	putative orf79.1C.crispus complete mitochondrial genome.unique orf
Contig338D	23870801_f1_2	890	3727	240	80					
Contig338D	30265640_f1_5	891	3728	1080	360	485	2.50E-46	Treponema pallidum	g1354775	pfoS/RpfoS/R Treponema pallidum methyl-accepting chemotaxis protein (mcp-1) gene, complete cds, and potential regulatory molecule (pfoS/R) gene, partial cds.potential regulatory molecule; pfoS/R-like
Contig338D	32680_f1_4	892	3729	936	312	776	3.60E-77	Staphylococcus aureus	P04188	glutamyl endopeptidase, precursor Staphylococcus aureus V8 serine protease gene.staphylococcal serine proteinasepreproenzyme (AA -68 to 268)
Contig338D	3361326_f3_6	893	3730	207	69					
Contig339D	1060337_c2_54	894	3731	747	249	706	9.50E-70	Bacillus subtilis	P39456	ORF3 putative ATP binding subunit B subtilis putative amino acid transporter gene.inner membrane protein malK.potential ABC-transport system
Contig339D	1207938_c3_64	895	3732	828	276	250	2.00E-21	Bacillus subtilis	g1934611	YrhG formate dehydrogenase Bacillus subtilis cysteine synthase (YrhA), cystathionine gamma-lyase (YrhB), YrhC (YrhC), YrhD (YrhD), formate dehydrogenase chain A (YrhE), YrhF (YrhF), formate dehydrogenase (YrhG), YrhH (YrhH), regulatory protein (YrhI), cytochrome

Contig339D	13843910_c1_50	896	3733	216	72	258	3.20E-22	Staphylococcus carnosus	g2529402	narT nitrate transporter Staphylococcus carnosus nitrate transporter (narT) gene, complete cds. NarT
Contig339D	14454083_f2_14	897	3734	471	157	259	2.20E-22	Bacillus subtilis	e1181515	ykmA YkmA Bacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR, similar to hypothetical proteins
Contig339D	15711457_f3_28	898	3735	201	67					
Contig339D	164715_c3_66	899	3736	951	317	424	3.00E-42	Bacillus subtilis	P42437	nasBES-adenosyl-L-methionine Bacillus subtilis DNA around narB region (nasB operon and nasA gene), alternate gene name
Contig339D	20524067_c1_41	900	3737	639	213	231	2.00E-19	Bacillus subtilis	e1186036	yvgV conserved hypothetical protein yvgV Bacillus subtilis complete genome (section 18 of 21) similar to hypothetical proteins
Contig339D	22299205_c3_60	901	3738	312	104	152	1.20E-10	Bacillus subtilis	d1020044	ydbO conserved hypothetical protein ydbO Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN, SIMILAR PRODUCT IN B. SUBTILIS
Contig339D	22345265_f1_9	902	3739	189	63					
Contig339D	24250177_c1_47	903	3740	714	238	159	8.70E-12	Bacillus subtilis	P42178	narJ Respiratory nitrate reductase B. subtilis narGHJ genes, gamma subunit
Contig339D	24353392_c2_57	904	3741	2409	803	2267	3.60E-235	Bacillus subtilis	P42435	nasBC subunit of nitrite reductase Bacillus subtilis DNA around narB region (nasB operon and nasA gene), alternate gene name
Contig339D	24416068_c1_43	905	3742	549	183	528	6.90E-51	Bacillus subtilis	g2293246	ytmI YtmI Bacillus subtilis rmb-dnaB genomic region, similar to a hypothetical 19 kD protein from B.
Contig339D	24648377_c3_71	906	3743	1146	382	1301	8.40E-133	Staphylococcus carnosus	g2529402	narT nitrate transporter Staphylococcus carnosus nitrate transporter (narT) gene, complete cds. NarT
Contig339D	24855337_c2_59	907	3744	693	231	577	4.40E-56	Bacillus subtilis	P42177	narI nitrate reductase gamma subunit B. subtilis nar[G,H,I,J,K
Contig339D	29532827_f2_21	908	3745	243	81					

Contig339D	3007827_c2_53	909	3746	789	263	605	4.80E-59	Bacillus subtilis	e1182313	yckKhomologue of glutamine-binding periplasmicBacillus subtilis complete genome (section 2 of 21)similar to glutamine ABC transporter
Contig339D	34033563_c1_46	910	3747	327	109	261	1.40E-22	Bacillus subtilis	P42436	nasBsubunit of nitrite reductaseBacillus subtilis DNA around narB region (nasB operon and nasAgene).alternate gene name
Contig339D	34194002_c2_52	911	3748	711	237	657	1.50E-64	Zymomonas mobilis	P30798	pgmphosphoglyceromutaseZymomonas mobilis phosphoglyceromutase (pgm) gene, complete cds,and 2-hydroxyacid dehydrogenase homologue (ddh) gene, 5' end.phosphoglycerate mutase
Contig339D	34385012_f2_18	912	3749	1362	454	364	4.90E-40	Methanosarcina barkeri	e212291	orf4hypothetical protein 4M.barkeri fmdE, fmdF, fmdA, fmdC, fmdD, fmdB, orf4, orf3, orf2, andorf1 genes.
Contig339D	34430428_c2_56	913	3750	375	125					
Contig339D	4069643_c3_63	914	3751	480	160					
Contig339D	4100453_c3_70	915	3752	1044	348	329	8.40E-30	Bacillus brevis	P54663	degSprotein kinaseBacillus brevis protein kinase (degS) gene, complete cds;transcriptional activator protein (degU) gene, complete cds.regulatory protein degSputative
Contig339D	4720317_f2_20	916	3753	1257	419	1460	1.20E-149	Staphylococcus simulans	g2072412	liflystaphin immunity factorStaphylococcus simulans lysostaphin (lss) and lysostaphin immunityfactor (lif) genes, complete cds, insertion sequence IS1293,complete sequence, and IS257-1 transposase (tnp-1) gene, completecds.similar to FemA and FemB of St
Contig339D	4737550_c3_65	917	3754	759	253	187	9.40E-15	Bacillus subtilis	e332188	ylnEYlnE proteinBacillus subtilis pyrE to ylnA gene region.similar to hypothetical proteins
Contig339D	4777217_c3_68	918	3755	1569	523	1883	1.80E-194	Bacillus subtilis	P42176	narHnitrate reductase beta subunitB.subtilis nar[G,H,I,J,K



Contig339D	4980378_c1_49	919	3756	537	179	328	1.10E-29	Bacillus subtilis	P13800	degUtranscriptional regulator of degradationB.subtilis iep gene encoding a protease production enhancerprotein, complete cds, and SacU enhancer protein gene, 3' end.regulatory protein comAiep protein
Contig339D	595260_c2_58	920	3757	3780	1260	4084	0	Bacillus subtilis	P42175	narORespiratory nitrate reductaseB.subtilis narGHJI genes.alpha subunit
Contig339D	6132893_c3_69	921	3758	462	154					
Contig339D	7039031_c3_61	922	3759	750	250	585	6.30E-57	Bacillus subtilis	P42200	ORF2putative membrane spanning subunitB.subtilis putative amino acid transporter gene.potential ABC-transport system
Contig339D	995300_f1_10	923	3760	204	68					
Contig340D	10548383_f1_1	924	3761	237	79					
Contig340D	1209417_c3_85	925	3762	1704	568	797	2.20E-79	Bacillus subtilis	P23545	phoRsignal transduction protein kinaseBacillus subtilis rmB-dnaB genomic region.
Contig340D	13001537_f3_53	926	3763	249	83					
Contig340D	13722338_c3_78	927	3764	507	169	505	1.90E-48	Bacillus subtilis	g2293238	ytgYtgIBacillus subtilis rmB-dnaB genomic region.similarity to tagD protein from V.cholerae
Contig340D	13723318_c3_80	928	3765	1149	383	1215	1.10E-123	Bacillus stearothermophilus	P17557	alanine dehydrogenase,B.stearothermophilus alanine dehydrogenase gene, complete cds.alanine dehydrogenasealanine dehydrogenase (EC 1.4.1.1)
Contig340D	14877316_f1_19	929	3766	378	126	311	6.80E-28	Escherichia coli	d1016364	YKL069W, YKL340hypothetical protein b1832E.coli genomic DNA, Kohara clone #335(40.9-41.3 min.).ORF_ID
Contig340D	19770437_c2_69	930	3767	1332	444	1018	8.20E-103	Bacillus subtilis	g2293258	ytoLYtoIBacillus subtilis rmB-dnaB genomic region.similarity with hypothetical protein 3 from
Contig340D	20901713_c3_76	931	3768	1707	569	613	6.80E-60	Bacillus subtilis	g2293228	ytwPYtwPBacillus subtilis rmB-dnaB genomic region.similarity to fcrA protein precursor from

Contig340D	2115812_f2_38	932	3769	1113	371	843	2.90E-84	Bacillus subtilis	c1184976	ykvYXaa-Pro dipeptidase homolog ykvYBacillus subtilis complete genome (section 8 of 21) similar to Xaa-Pro dipeptidase
Contig340D	21491462_c1_63	933	3770	1161	387	1188	7.90E-121	Bacillus subtilis	g2293267	citZcitrate synthase subunit IIBacillus subtilis rmB-dnaB genomic region.alternate gene name
Contig340D	2189718_f3_46	934	3771	1371	457	1309	1.20E-133	Escherichia coli	P39312	cycAd-serine/d-alanine/glycine transporterEscherichia coli K-12 MG1655 section 382 of 400 of the completegenome.o470; 100 pct identical amino acid sequence and
Contig340D	22277327_c3_91	935	3772	1371	457	496	1.70E-47	Bacillus subtilis	P07908	dnaBDnaBBacillus subtilis rmB-dnaB genomic region. The part of the protein encoded by 634-693 binds to
Contig340D	23485443_c1_54	936	3773	1239	413	931	1.40E-93	Bacillus subtilis	g2293230	ytbYtbBacillus subtilis rmB-dnaB genomic region. similar to hypothetical protein MG372 from M.
Contig340D	23489090_c2_72	937	3774	1038	346	1033	2.10E-104	Bacillus subtilis	g2293264	pfk6-phosphofructokinaseBacillus subtilis rmB-dnaB genomic region.
Contig340D	23555302_f2_40	938	3775	387	129					
Contig340D	23603375_f2_37	939	3776	417	139	139	1.10E-09	Methanococcus jannaschii	Q57997	MJ0577conserved hypothetical proteinMethanococcus jannaschii section. 48 of 150 of the complete genome.hypothetical protein b0607similar to SP
Contig340D	23651567_c3_87	940	3777	888	296	387	4.30E-41	Thermus thermophilus	d1025814	mutMTThermus thermophilus MutM gene, complete cds.
Contig340D	24017890_c2_75	941	3778	1428	476	1242	1.50E-126	Escherichia coli	g1788480	lysPlysine-specific permeaseEscherichia coli K-12 MG1655 section 195 of 400 of the completegenome.arginine permeasef489; 100 pct identical to LYSP_ECOLI SW
Contig340D	24407577_c1_65	942	3779	738	246	833	3.30E-83	Bacillus subtilis	P13792	phoPB.subtilis phoP gene.
Contig340D	24407765_c1_55	943	3780	795	265	413	1.10E-38	'Pseudomonas denitrificans'	P29942	hypothetical protein 9P.denitrificans cobN, cobO, cobP, cobQ, cobW, and ORF6-9 genes, complete cds. ORF9

Contig340D	24508552_c3_92	944	3781	1953	651	2471	8.80E-257	Bacillus subtilis	P18255	thrS threonine tRNA synthetase subtilis rrmB-dnaB genomic region.threonine-tRNA ligase(thrSv) (EC 6.1.1.3)
Contig340D	24662915_c3_86	945	3782	2718	906	2572	1.70E-267	Bacillus subtilis	g2293272	polADNA-polymerase IBacillus subtilis rrmB-dnaB genomic region.
Contig340D	24726077_c3_89	946	3783	1026	342	1088	3.10E-110	Bacillus subtilis	g2293277	gapBglyceraldehyde-3-P- dehydrogenaseBacillus subtilis rrmB-dnaB genomic region.
Contig340D	25398425_c2_67	947	3784	1167	389	731	2.10E-72	Bacillus subtilis	g2293229	nifS2NiS2Bacillus subtilis rrmB-dnaB genomic region.similar to R.sphaeroides nitrogenase stabilizer
Contig340D	25667217_c3_88	948	3785	627	209	405	7.50E-38	Bacillus subtilis	g2293275	ytaGYtaGBacillus subtilis rrmB-dnaB genomic region.similar to hypothetical protein HI0890 from H.
Contig340D	26181551_c2_71	949	3786	948	316	1016	1.30E-102	Bacillus subtilis	g2293263	accAacetyl-CoA carboxylase subunitBacillus subtilis rrmB-dnaB genomic region.
Contig340D	26188891_f1_7	950	3787	210	70					
Contig340D	3140917_c3_83	951	3788	189	63					
Contig340D	33209677_c2_70	952	3789	972	324	764	6.80E-76	Bacillus subtilis	g2293259	ytiYtiqIBacillus subtilis rrmB-dnaB genomic region.similarity to MGPA protein from M.genitalium
Contig340D	33985077_c1_61	953	3790	1230	410	1529	5.80E-157	Bacillus subtilis	g2293261	lysJYtsIBacillus subtilis rrmB-dnaB genomic region.similarity to malate dehydrogenase (NADP+) from
Contig340D	34177127_c1_62	954	3791	1806	602	1853	2.70E-191	Bacillus licheniformis	P51181	PYKPyruvate KinaseBacillus licheniformis gene for pyruvate kinase, complete cds.pyruvate kinase
Contig340D	34181551_c2_74	955	3792	924	308	618	2.00E-60	Bacillus subtilis	P06567	dnaIDnaIBacillus subtilis rrmB-dnaB genomic region.44K dnaA protein homologORF 311 (AA 1-311)
Contig340D	35360932_c3_79	956	3793	1278	426	1493	3.80E-153	Bacillus subtilis	P37877	ackAacetate kinaseBacillus subtilis rrmB- dnaB genomic region.acetate kinase
Contig340D	4459380_c1_57	957	3794	207	69					
Contig340D	4693800_f2_39	958	3795	570	190	191	3.50E-15	Methanobacteri um thermoautotrop hicum	g2621993	MTH898conserved proteinMethanobacterium thermoautotrophicum from bases 808939 to 820180(section 71 of 148) of the complete genome.Function Code

Contig340D	5135265_c3_90	959	3796	504	168	434	6.30E-41	Bacillus subtilis	g2293279	ytGyTcGBacillus subtilis rrmB-dnaB genomic region.similar to hypothetical protein HI0943 from H.
Contig340D	5882753_c3_84	960	3797	273	91					
Contig340D	6125262_c2_73	961	3798	192	64					
Contig340D	6906300_c2_68	962	3799	1014	338	519	6.20E-50	Bacillus subtilis	g2293239	ytXKYtK Bacillus subtilis rrmB-dnaB genomic region.similarity to modification methylase AccI
Contig340D	7066588_c1_60	963	3800	3204	1068	1849	4.20E-212	Bacillus subtilis	g2293260	dnaEDNA-polymerase III alpha-chainBacillus subtilis rrmB-dnaB genomic region.
Contig340D	7244012_c1_64	964	3801	1287	429	1768	2.70E-182	Bacillus israeli	e320380	isocitrate dehydrogenaseBacillus israeli isocitrate dehydrogenase gene.
Contig340D	803393_c3_81	965	3802	732	244	536	9.80E-52	Archaeoglobus fulgidus	g2649315	AF1265conserved hypothetical proteinArchaeoglobus fulgidus section 90 of 172 of the complete genome.similar to GB
Contig340D	824086_c3_82	966	3803	882	294	859	5.80E-86	Bacillus subtilis	g2293262	ytllacetyl-CoA carboxylase subunitBacillus subtilis rrmB-dnaB genomic region.similar to acetyl-CoA carboxylase
Contig341D	125880_f3_28	967	3804	309	103					
Contig341D	13678452_c2_47	968	3805	1263	421	438	2.40E-41	Bacillus subtilis	p55340	ecsBhypothetical EcsB proteinB.subtilis ecsA, ecsB, and ecsC genes.alternate gene name
Contig341D	14656327_c3_55	969	3806	624	208	799	1.30E-79	Staphylococcus aureus	g1916729	cadDCadDStaphylococcus aureus plasmid pRW001, cadmium resistance
Contig341D	16533442_c1_33	970	3807	522	174	546	8.50E-53	Bacillus subtilis	g1381681	CadD(cadD) gene, complete cds.contains 5 transmembrane domains; confers low level
Contig341D	165908_f1_3	971	3808	507	169	182	3.20E-14	Bacillus subtilis	p38049	cspRCspRBacillus subtilis methylase homolog (cspR) gene, complete cds.methylase homolog
Contig341D	19922162_c2_41	972	3809	1161	387	517	1.00E-49	Bacillus subtilis	e1182980	yhgC Hypothetical proteinBacillus subtilis penicillin-binding protein (pbpF) gene, 5' end.product unknown
Contig341D										yheBhypothetical proteinBacillus subtilis complete genome (section 6 of 21)

Contig341D	20706557_c2_43	973	3810	1254	418	592	1.10E-57	Bacillus subtilis e1182993	yhaO Hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hypothetical proteins
Contig341D	21645967_fl_7	974	3811	993	331	363	2.10E-33	Bacillus subtilis P24327	prsA 33kDa lipoprotein B. subtilis prsA gene for a 33kDa lipoprotein. See Swiss Prot P24327
Contig341D	23694052_f3_27	975	3812	603	201				
Contig341D	2380342_c1_36	976	3813	636	212	463	5.30E-44	Bacillus subtilis e1182922	yhcZ Hypothetical protein Bacillus subtilis complete genome (section 5 of 21) similar to two-component response regulator [YhcY]
Contig341D	24025463_c3_53	977	3814	2952	984	1357	9.80E-139	Staphylococcus aureus g710421	unknown Staphylococcus aureus cmp-binding-factor 1 (cbf1) and ORF X genes, complete cds. ORF X
Contig341D	24120262_c1_32	978	3815	993	331	451	1.00E-42	Bacillus subtilis P54536	yqiY YqiY Bacillus subtilis DNA, 283 Kb region containing skin element similar to amino acid ABC transporter (permease)
Contig341D	24296943_fl_15	979	3816	261	87	93	8.60E-05	Pyrococcus horikoshii d1027256	PHBN033139aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 85072-124749 nt position, clone
Contig341D	24490702_c3_51	980	3817	405	135				
Contig341D	24744077_c1_34	981	3818	183	61				
Contig341D	2538252_c3_56	982	3819	981	327	988	1.20E-99	Bacillus subtilis P32396	hemH ferredoxin-like protein Bacillus subtilis penicillin binding protein 1A (ponA) gene; uroporphyrinogen decarboxylase (hemE) gene; ferredoxin (hemH) gene complete cds, (hemY) gene, complete cds; ORFA, complete cds; ORFB 5' end, alternate gene name
Contig341D	30114637_c2_39	983	3820	1167	389	1177	1.20E-119	Bacillus subtilis e1182880	yhbA Hypothetical 48.5 kd protein Bacillus subtilis complete genome (section 5 of 21) alternate gene name
Contig341D	33647577_c1_35	984	3821	1386	462	1586	5.30E-163	Bacillus subtilis e1249821	citG fumarate protein, CitG Bacillus subtilis 42.7kDa DNA fragment from yvsA to yvqA.
Contig341D	33831512_f3_30	985	3822	234	78				

Contig341D	34272752_c2_44	986	3823	963	321	1413	1.10E-144	Staphylococcus aureus	g710422	cbfI cmp-binding-factor 1Staphylococcus aureus cmp-binding-factor 1 (cbfI) and ORF X genes, complete cds.
Contig341D	34617017_c2_46	987	3824	696	232	708	5.80E-70	Bacillus subtilis	P55339	ecsAputative ATP-binding protein of ABC typeB.subtilis ecsA, ecsB, and ecsC genes.alternate gene name
Contig341D	3906642_c2_50	988	3825	600	200	244	8.60E-21	Bacillus subtilis	d1020114	ydeNhypothetical protein ydeNBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.FUNCTION UNKNOWN.
Contig341D	4073892_c2_49	989	3826	1458	486	1083	1.10E-109	Bacillus subtilis	P32397	hemYprotoporphyrinogen IX and coproporphyrinogen IIIBacillus subtilis penicillin binding protein 1A (ponA) gene;uroporphyrinogen decarboxylase (hemE) gene; ferrochelatase (hemH)gene complete cds, (hemY) gene, complete cds; ORFA, complete cds;ORFB 5' end.a
Contig341D	4173427_c1_37	990	3827	474	158					
Contig341D	4345967_f3_25	991	3828	441	147	368	6.20E-34	Bacillus subtilis	e1183005	hitHit-like proteinBacillus subtilis complete genome (section 6 of 21)alternate gene name
Contig341D	4568761_c2_48	992	3829	1116	372	1257	3.90E-128	Bacillus subtilis	P32395	hemEuroporphyrinogen decarboxylaseBacillus subtilis penicillin binding protein 1A (ponA) gene;uroporphyrinogen decarboxylase (hemE) gene; ferrochelatase (hemH)gene complete cds, (hemY) gene, complete cds; ORFA, complete cds;ORFB 5' end.see Swiss Prot P323
Contig341D	4876718_c3_52	993	3830	1143	381	810	9.00E-81	Bacillus subtilis	e1182921	yhcYhypothetical proteinBacillus subtilis complete genome (section 5 of 21)similar to two-component sensor histidine kinase
Contig341D	4882963_f1_10	994	3831	834	278	457	2.30E-43	Bacillus subtilis	P54604	yhcYhypothetical proteinB.subtilis chromosomal DNA (region 75 degreesSimilarity to DRAP deaminase from Saccharomyces

Contig341D	5132078_c2_38	995	3832	729	243	752	1.30E-74	Archaeoglobus fulgidus	g2649950	AF0680 glutamine ABC transporter, ATP-binding protein Archaeoglobus fulgidus section 49 of 172 of the complete genome, similar to GB
Contig341D	6689717_c2_40	996	3833	615	205					
Contig341D	6929651_c2_42	997	3834	366	122	289	1.50E-25	Bacillus subtilis	e1182981	yeA hypothetical protein Bacillus subtilis complete genome (section 6 of 21)
Contig341D	817555_f3_26	998	3835	447	149					
Contig342D	10193763_c1_46	999	3836	186	62					
Contig342D	10360902_f1_6	1000	3837	183	61					
Contig342D	1063753_c1_50	1001	3838	1374	458	2070	2.70E-214	Staphylococcus aureus	g2271510	murD UDP-N-acetyl/muramoyl-L-alanine Staphylococcus aureus UDP-N-acetyl/muramoyl-L-alanine MurD
Contig342D	11806512_f1_17	1002	3839	207	69					
Contig342D	1209682_c1_41	1003	3840	2409	803	1984	3.50E-205	Bacillus subtilis	e1184112	pheT phenylalanyl-tRNA synthetase (beta subunit) Bacillus subtilis complete genome (section 15 of 21) phenylalanyl-tRNA synthetase beta subunit
Contig342D	14644066_c1_47	1004	3841	189	63					
Contig342D	14664012_f3_34	1005	3842	468	156	341	4.50E-31	Bacillus subtilis	e334785	yilPY1bP protein Bacillus subtilis genomic DNA 23.9kB fragment
Contig342D	19957802_c3_73	1006	3843	1896	632	1972	6.60E-204	Bacillus subtilis	P14951	uvrB deoxyribodipyrimidine photolyase Bacillus subtilis thioredoxin (trx), uvrB and aspartokinase II genes, complete cds. excinuclease ABC, chain Calternate gene name
Contig342D	20502217_c2_64	1007	3844	1626	542	718	5.10E-71	Bacillus subtilis	e1185102	yilA hypothetical protein yilA Bacillus subtilis complete genome (section 8 of 21)
Contig342D	211677_c2_63	1008	3845	702	234	436	3.90E-41	Bacillus subtilis	e1182712	yfnBYfnB Bacillus subtilis complete genome (section 4 of 21) similar to hypothetical proteins
Contig342D	21656327_c3_78	1009	3846	936	312	1464	4.50E-150	Staphylococcus aureus	g2149891	yilC unknown Staphylococcus aureus strain ATCC 8325-4 cell wall/cell division gene cluster, yilB, yilC, yilD, pbpA, mraY, murD, divIB, ftsA and ftsZ genes, complete cds.
Contig342D	22542567_c1_40	1010	3847	759	253	562	1.70E-54	Bacillus subtilis	e1184114	ysgA hypothetical protein Bacillus subtilis complete genome (section 15 of 21) similar to rRNA methylase

Contig342D	23438887_c3_71	1011	3848	300	100	196	1.00E-15	Bacillus subtilis	e1184110	ysbAhypothetical proteinBacillus subtilis complete genome (section 15 of 21) unknown function; putative
Contig342D	23572178_c1_43	1012	3849	846	282	1070	2.50E-108	Bacillus subtilis	g143527	sdhBsuccinate dehydrogenase (iron-sulfur protein)B. subtilis succinate dehydrogenase complex encoding cytochrome-b-558 subunit, complete cds, and flavoprotein subunit, 5' end.iron-sulfur protein
Contig342D	24025467_c1_45	1013	3850	522	174	238	3.70E-20	Bacillus subtilis	P94559	ysbBhypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to hypothetical proteins
Contig342D	24245437_c3_80	1014	3851	1005	335	1471	8.10E-151	Staphylococcus aureus	d1023423	mraYMRAYStaphylococcus aureus genes for penicillin-binding protein I, MraY, MurD, partial and complete cds.
Contig342D	24330337_fl_15	1015	3852	957	319	555	9.50E-54	Bacillus subtilis	e1184111	ysgBhypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to hypothetical proteins
Contig342D	24642817_c1_44	1016	3853	810	270	1197	8.80E-122	Staphylococcus haemolyticus	P52974	dgaIglutamate racemaseStaphylococcus haemolyticus Y176 glutamate racemase (dga) gene, complete cds.
Contig342D	25425202_c3_72	1017	3854	522	174	196	1.00E-15	Bacillus subtilis	e1184109	ysbBhypothetical proteinBacillus subtilis complete genome (section 15 of 21) unknown function; putative
Contig342D	25475250_c2_61	1018	3855	1827	609	2503	3.60E-260	Bacillus subtilis	A27763	sdhAsuccinate dehydrogenase, flavoproteinflavoprotein
Contig342D	26597077_c1_51	1019	3856	1398	466	1113	7.00E-113	Staphylococcus aureus	g2149896	div1Bcell division proteinStaphylococcus aureus strain ATCC 8325-4 cell wall/cell division gene cluster, yllB, yllC, yllD, ppbA, mraY, murD, div1B, ftsA andftsZ genes, complete cds.
Contig342D	33651636_c2_58	1020	3857	1776	592	1528	7.40E-157	Bacillus subtilis	e1184108	ysbChypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to DNA polymerase beta



Contig342D	34644125_c1_52	1021	3858	1170	390	1559	3.90E-160	Staphylococcus aureus	g2149897	ftsA cell division proteinStaphylococcus aureus strain ATCC 8325-4 cell wall/cell division gene cluster, yllB, yllC, yllD, pbpA, mraY, murD, div1B, ftsA andftsZ genes, complete cds.
Contig342D	34646937_c2_60	1022	3859	336	112	334	2.50E-30	Bacillus subtilis	g142520	trxthioredoxinBacillus subtilis thioredoxin (trx), uvrB and aspartokinase II genes, complete cds.thioredoxinputative
Contig342D	36147150_c3_75	1023	3860	609	203	492	4.50E-47	Bacillus subtilis	e1184085	ysnAhypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to hypothetical proteins
Contig342D	36520302_c1_48	1024	3861	189	63	250	2.00E-21	Staphylococcus aureus	O07319	yllBunknownStaphylococcus aureus strain ATCC 8325-4 cell wall/cell division gene cluster, yllB, yllC, yllD, pbpA, mraY, murD, div1B, ftsA andftsZ genes, complete cds.
Contig342D	4067342_c2_57	1025	3862	1086	362	1267	3.40E-129	Bacillus subtilis	P17921	pheSphenylalanyl-tRNA synthetase (alpha subunit)Bacillus subtilis complete genome (section 15 of 21)phenylalanyl-tRNA synthetase beta subunit
Contig342D	4306562_c3_77	1026	3863	306	102	469	1.20E-44	Staphylococcus aureus	O07319	yllBunknownStaphylococcus aureus strain ATCC 8325-4 cell wall/cell division gene cluster, yllB, yllC, yllD, pbpA, mraY, murD, div1B, ftsA andftsZ genes, complete cds.
Contig342D	4330275_c2_53	1027	3864	297	99	94	6.70E-05	Human papillomavirus	P06460	E5A proteinGenital human papillomavirus type 6b (HPV6b).papillomavirus E5 proteinopen reading frame E5a
Contig342D	4457788_f3_39	1028	3865	1716	572	266	7.40E-20	Plasmodium reichenowi	g535260	STARP antigenP.reichenowi STARP gene for STARP antigen.
Contig342D	4532967_c2_59	1029	3866	2358	786	1882	2.30E-194	Bacillus subtilis	e1184107	ysnDhypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to DNA mismatch repair protein

Contig342D	4696068_c3_69	1030	3867	186	62	237	4.70E-20	BACILLUS STEAROTHER MOPHILUS	P07840	RPMFribosomal protein BL3750S RIBOSOMAL PROTEIN L32 (RIBOSOMAL PROTEIN I) (BL37)Bacillus stearothermophilus ribosomal protein BL37
Contig342D	4725415_c1_49	1031	3868	2337	779	3205	0	Staphylococcus aureus	d1023422	pbpApenicillin-binding protein lStaphylococcus aureus genes for penicillin-binding protein I, MraY, MurD, partial and complete cds.
Contig342D	6131693_c3_79	1032	3869	414	138	574	9.20E-56	Staphylococcus aureus	d1023421	yilDcell division proteinStaphylococcus aureus genes for penicillin-binding protein I, MraY, MurD, partial and complete cds.unnamed protein product
Contig342D	968811_c3_74	1033	3870	651	217	599	2.10E-58	Bacillus subtilis	P08064	sdhCsuccinate dehydrogenase (cytochrome b558B.subtilis succinate dehydrogenase complex encoding cytochrome-b-558 subunit, complete cds, and flavoprotein subunit, 5' end.succinate dehydrogenase cytochrome b558succinate dehydrogenase cytochrome b-558 subunit
Contig343D	10580443_c2_74	1034	3871	237	79	246	5.30E-21	Escherichia coli	P33014	yeedHypothetical 8.1 kD protein in sbcB 3'regionE.coli genomic DNA, Kohara clone #349(44.6-45.0 min.) ORF_ID
Contig343D	1417338_c3_81	1035	3872	228	76					ydiBconserved hypothetical protein ydiBBacillus subtilis complete genome (section 4 of 21)similar to hypothetical proteins
Contig343D	14493812_c2_71	1036	3873	465	155	289	1.50E-25	Bacillus subtilis	e1182570	ilvNacetolactate synthase small subunitBacillus subtilis ilvB, ilvN and ilvC genes, complete ilv- leuoperon.acetolactate synthase (acetohydroxy-acid synthase)
Contig343D	1461637_fl_11	1037	3874	249	83	123	5.70E-08	Bacillus subtilis	P37252	putative orf79.1C.crispus complete mitochondrial genome.unique orf
Contig343D	14849093_c1_45	1038	3875	294	98	127	2.10E-08	Mitochondrion Chondrus crispus	e138028	

Contig343D	14897837_f3_41	1039	3876	1275	425	1161	3.60E-128	LACTOCOCCUS LACTIS	Q02145	ILV Aprobable threonine dehydratase, DEAMINASE(threonine dehydratase)
Contig343D	16453328_f3_37	1040	3877	339	113	113	1.80E-05	Chloroplast Marchantia polymorpha	P12221	5S rRNA hypothetical protein 1068 Liverwort Marchantia polymorpha chloroplast genome DNA ORF 1068
Contig343D	1702_f1_2	1041	3878	522	174					
Contig343D	19564128_c3_89	1042	3879	315	105					
Contig343D	19564400_c3_92	1043	3880	321	107	113	6.50E-07	Kinetoplast Trypanosoma brucei	g501027	Trypanosoma brucei EATRO 164 kinetoplast (CR4) mRNA, complete cds. ORF2
Contig343D	20422318_f2_20	1044	3881	417	139	105	1.80E-05	Bacillus subtilis	e1183973	glnHglutamine ABC transporter (glutamine-binding Bacillus subtilis complete genome (section 14 of 21)
Contig343D	22441907_f1_10	1045	3882	1869	623	1924	8.10E-199	Bacillus subtilis	P51785	ilvDdihydroxy-acid dehydratase Bacillus subtilis (YAC10-9 clone) DNA region between the serA and kgd loci. 51.0% identity with the Escherichia coli
Contig343D	22939705_c2_79	1046	3883	402	134					
Contig343D	23478463_f2_31	1047	3884	1755	585	1667	1.40E-171	Bacillus subtilis	e1184080	ilvBacetylacetyl synthase (acetohydroxy-acid Bacillus subtilis complete genome (section 15 of 21) acetolactate synthase (acetohydroxy-acid synthase)
Contig343D	23626577_c1_62	1048	3885	210	70					
Contig343D	23867325_f1_15	1049	3886	570	190	561	2.20E-54	Lactococcus lactis	Q02144	leuDLeuDLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisE (hisE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig343D	24343813_c2_73	1050	3887	1119	373	1075	7.50E-109	Escherichia coli	P33015	yeE hypothetical 38.1 kD protein in sbcB 3' region E. coli genomic DNA, Kohara clone #349(44.6-45.0 min.). ORF_ID
Contig343D	24640625_c3_91	1051	3888	960	320	954	5.00E-96	Staphylococcus xylosus	e264641	scrRucrose repressor S. xylosus scrB and scrR genes.

Contig343D	24642202_c3_94	1052	3889	648	216	822	4.80E-82	Staphylococcus aureus	g2689554	Staphylococcus aureus toxic shock syndrome toxin-1 (tst), enterotoxin (ent), and integrase (int) genes, complete cds.orf7
Contig343D	24646962_c2_78	1053	3890	210	70					
Contig343D	24814812_f2_29	1054	3891	1950	650	1516	1.40E-155	Bacillus subtilis	e1182574	ydiFABC transporter (ATP-binding protein) homolog ydiFBacillus subtilis complete genome (section 4 of 21) similar to ABC transporter (ATP-binding protein)
Contig343D	24823588_f1_14	1055	3892	1386	462	1633	5.50E-168	Lactococcus lactis	Q02142	leuCLeuLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisE (hisE), unknown, unknown, LeuA(leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig343D	25665687_c1_63	1056	3893	876	292	322	4.70E-29	Staphylococcus aureus	g2689560	Staphylococcus aureus toxic shock syndrome toxin-1 (tst), enterotoxin (ent), and integrase (int) genes, complete cds.orf13
Contig343D	25900300_c1_61	1057	3894	312	104	297	2.10E-26	Staphylococcus aureus	g2689561	Staphylococcus aureus toxic shock syndrome toxin-1 (tst), enterotoxin (ent), and integrase (int) genes, complete cds.orf14
Contig343D	26615912_c1_56	1058	3895	1479	493	1943	7.80E-201	Staphylococcus xylosum	Q05936	scrBbeta-fructofuranosidaseS.xylosum scrB and scrR genes.
Contig343D	2866090_f1_1	1059	3896	1254	418	1250	2.10E-127	Staphylococcus aureus	g2689564	integrateStaphylococcus aureus toxic shock syndrome toxin-1 (tst), enterotoxin (ent), and integrase (int) genes, complete cds.similar to staphylococcal phage integrase
Contig343D	31680342_f2_21	1060	3897	546	182	173	8.00E-12	Kaposi's sarcoma-associated herpes-like virus	g1633572	Kaposi's sarcoma-associated herpes-like virus ORF73 homolog gene, complete cds.Herpesvirus saimiri ORF73 homolog
Contig343D	3361326_c3_82	1061	3898	207	69					

Contig343D	34257878_f1_13	1062	3899	1065	355	894	1.10E-89	Lactococcus lactis	Q02143	leuB, leuB, Lactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisE (hisE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig343D	34412750_c1_57	1063	3900	966	322	1031	3.40E-104	Staphylococcus aureus	g46512	hypothetical protein 7S.aureus agrA, agrB and hld genes.orf 7
Contig343D	35428187_c2_80	1064	3901	438	146					
Contig343D	35598750_f2_19	1065	3902	849	283	112	3.30E-06	Streptococcus thermophilus bacteriophage TP-J34	g2897106	repressor, Streptococcus thermophilus bacteriophage lysogeny module, integrase homolog (int), putative host cell surface-exposed lipoprotein, putative metallo-proteinase, repressor, Cro-like regulatory protein, and P1-antirepressor homolog genes, complete cds.
Contig343D	36132937_f1_8	1066	3903	1641	547	273	8.00E-20	Streptococcus pneumoniae	P10564	hexA mismatch repair protein, S.pneumoniae mismatch repair protein (hexA) gene, complete cds.
Contig343D	36206502_c1_51	1067	3904	483	161	340	5.80E-31	Bacillus subtilis	e1182572	ylidRibosomal-protein-alanine N-acetyltransferase homolog ylidBacillus subtilis complete genome (section 4 of 21) similar to ribosomal-protein-alanine
Contig343D	36441292_f2_34	1068	3905	210	70	101	3.60E-05	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position, clone
Contig343D	36601678_c3_93	1069	3906	1728	576					
Contig343D	4707506_c3_90	1070	3907	1314	438	1156	2.00E-117	Bacillus subtilis	Q07429	nrgA membrane-associated protein, Bacillus subtilis operon membrane-associated protein (nrgA), and PII-like protein (nrgB) genes, complete cds, putative
Contig343D	4958387_c2_72	1071	3908	537	179	305	2.90E-27	Bacillus subtilis	e1182571	ylidC glycoprotein endopeptidase homolog ylidC Bacillus subtilis complete genome (section 4 of 21) similar to glycoprotein endopeptidase

Contig343D	5359438_c3_88	1072	3909	1107	369	1096	4.50E-111	Bacillus subtilis	e1182573	ydiEGlycoprotein endopeptidase homolog ydiEBacillus subtilis complete genome (section 4 of 21) similar to glycoprotein endopeptidase
Contig343D	5909428_c1_55	1073	3910	750	250	568	4.00E-55	Bacillus subtilis	e1182576	ydiHhypothetical protein ydiHBacillus subtilis complete genome (section 4 of 21)
Contig343D	860790_f2_32	1074	3911	1593	531	1391	2.40E-142	Lactococcus lactis	g2565151	leuALeuALactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hish), HisA (hisA), HisF (hisF), HisIE (hisIE), unknown, unknown, LeuA(leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig343D	9843800_f3_39	1075	3912	192	64					
Contig343D	995451_f1_12	1076	3913	1020	340	1139	1.20E-115	Bacillus subtilis	P37253	ilvCketol-acid reductoisomeraseBacillus subtilis ilvB, ilvN and ilvC genes, complete ilv-leuoperon.ketol-acid reductoisomerase (acetoxyhydroxy-acid
Contig344D	10410638_c2_202	1077	3914	330	110	267	3.10E-23	Staphylococcus aureus	g1595809	spsAtype-I signal peptidase SpsAStaphylococcus aureus type-I signal peptidase SpsA (spsA) gene, and type-I signal peptidase SpsB (spsB) gene, complete cds.inactive signal peptidase homologue; protein lacks
Contig344D	10646950_c2_238	1078	3915	1221	407	1151	6.60E-117	Bacillus subtilis	g1934606	yrhBcystathionine gamma-lyaseBacillus subtilis cysteine synthase (yrhA), cystathionine gamma-lyase (yrhB), YrhC (yrhC), YrhD (yrhD), formate dehydrogenase chain A (yrhE), YrhF (yrhF), formate dehydrogenase (yrhG), YrhH(yrhH), regulatory protein (yrhI), cyto
Contig344D	10760378_c1_200	1079	3916	210	70					

Contig344D	10948587_c2_225	1080	3917	822	274	706	9.50E-70	Bacillus subtilis	e1183364	ykoYtoxic anion resistance protein homolog ykoYBacillus subtilis complete genome (section 7 of 21)similar to toxic anion resistance protein
Contig344D	11062_f3_152	1081	3918	1128	376	218	1.70E-15	Rhodobacter capsulatus	g3128293	hypothetical proteinRhodobacter capsulatus strain SB1003, partial genome.
Contig344D	1171892_f3_142	1082	3919	261	87	110	2.50E-06	Kinetoplast Bodo saltans	g3037018	ND5NADH dehydrogenase subunit 5Bodo saltans NADH dehydrogenase subunit 5 (ND5) mRNA, kinetoplastgene encoding Kinetoplast protein, partial cds.partially edited mRNA
Contig344D	1178785_c1_198	1083	3920	939	313	731	2.10E-72	Bacillus subtilis	g1934605	yrhAcysteine synthaseBacillus subtilis cysteine synthase (yrhA), cystathioninegamma-lyase (yrhB), YrhC (yrhC), YrhD (yrhD), formate dehydrogenasechain A (yrhE), YrhF (yrhF), formate dehydrogenase (yrhG), YrhH(yrhH), regulatory protein (yrhI), cytochrome P
Contig344D	11931540_f2_63	1084	3921	825	275	786	3.20E-78	Staphylococcus xylosus	e352090	transcriptional regulator from the LysR-typeStaphylococcus xylosus lacR, lacP, lacH genes and 2 ORF's. ORF1
Contig344D	12603166_f2_59	1085	3922	303	101	100	1.60E-05	Pyrococcus horikoshii	d1027339	PHBW012106aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position, clone
Contig344D	126068_f3_122	1086	3923	555	185	119	2.60E-06	Escherichia coli	P05530	MCBGmbcG proteinE. coli genes mcbE, mcbF and mcbG for microcin B17 immunity onwildtype plasmid pMecB17.McbG gene product (AA 1-187)
Contig344D	12681510_f2_100	1087	3924	825	275	702	2.50E-69	Bacillus subtilis	e261990	putative orfYitUB.subtilis nprB gene.similar to hypothetical proteins
Contig344D	12750290_c2_207	1088	3925	1122	374	1233	1.40E-125	Bacillus subtilis	e1183166	oppDoligopeptide ABC transporter (ATP-binding)Bacillus subtilis complete genome (section 7 of 21)alternate gene name

Contig344D	13089052_f2_80	1089	3926	240	80	112	8.30E-07	Staphylococcus aureus	g295834	replication protein REPS.aureus plasmid pOX2000. ORF 154
Contig344D	13678300_c3_273	1090	3927	1233	411	1393	1.50E-142	Bacillus subtilis	e1182288	yciChomologues to nitrile hydratase regionBacillus subtilis complete genome (section 2 of 21)similar to hypothetical proteins
Contig344D	14271068_f3_124	1091	3928	261	87					
Contig344D	1445930_f1_16	1092	3929	621	207					
Contig344D	14460882_c2_230	1093	3930	1695	565	1304	4.00E-133	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, complecteds. ORF1
Contig344D	15022153_f3_135	1094	3931	189	63					
Contig344D	15900305_f3_115	1095	3932	789	263					
Contig344D	16196963_f1_13	1096	3933	192	64					
Contig344D	16257665_f3_118	1097	3934	192	64					
Contig344D	16281286_c1_197	1098	3935	1359	453	1059	3.70E-107	Bacillus subtilis	e1182948	yhdHhypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to sodium-dependent transporter
Contig344D	16832562_f3_150	1099	3936	804	268	320	3.70E-36	Bacillus subtilis	e1183175	yjbHhypothetical protein yjbHBacillus subtilis complete genome (section 7 of 21)
Contig344D	187683_c2_218	1100	3937	228	76	256	1.10E-23	Staphylococcus aureus	P20384	BIN3Staphylococcus aureus plasmid p19789 DNA with binR and bin3 genes, derived from transposon TN552.bin3 product
Contig344D	19547938_c3_261	1101	3938	372	124	224	6.10E-18	LEUCONOST OC MESENTEROI DES	P11411	ZWFGLUCOSE-6-PHOSPHATE 1-DEHYDROGENASE, (G6PD)
Contig344D	1960952_c3_249	1102	3939	906	302	575	7.20E-56	Bacillus subtilis	e1183077	yisKYisKBacillus subtilis complete genome (section 6 of 21)similar to 5-oxo-1,2,5-tricarboxilic-3-penten acid



Contig344D	19610442_f3_148	1103	3940	246	82	132	6.30E-09	Bacillus anthracis	g929968	Bacillus anthracis Sterne toxin plasmid pXO1 right inverted repeat element (SterneR) bordering the toxin-encoding region, ORFA and truncated ORFB genes, complete cds. ORFA; similar to B. anthracis WeyAR element ORFA;
Contig344D	19712762_c3_288	1104	3941	600	200	813	4.30E-81	Bacillus subtilis	P24277	recK recombination protein B. subtilis DNA, 180 kilobase region of replication origin, alternate gene name
Contig344D	19790902_c3_257	1105	3942	813	271	919	2.50E-92	Bacillus subtilis	e1183181	yjbN conserved hypothetical protein yjbN Bacillus subtilis complete genome (section 7 of 21) similar to hypothetical proteins
Contig344D	19960162_c2_236	1106	3943	2631	877	1785	4.30E-184	Bacillus subtilis	e1182118	ybcD hypothetical protein ybcD Bacillus subtilis complete genome (section 1 of 21)
Contig344D	20093_c1_190	1107	3944	306	102					
Contig344D	20314005_c3_283	1108	3945	4590	1530	4186	0	Bacillus subtilis	e1183503	glgA glutamate synthase (large subunit) Bacillus subtilis complete genome (section 10 of 21)
Contig344D	20517062_c3_252	1109	3946	1002	334	961	9.00E-97	Bacillus subtilis	e1183136	yjaX3-oxoacyl-acyl-carrier protein synthase homolog yjaX Bacillus subtilis complete genome (section 6 of 21) similar to 3-oxoacyl-acyl-carrier protein
Contig344D	20602262_c2_245	1110	3947	543	181					
Contig344D	20602263_c3_274	1111	3948	1512	504	1414	8.90E-145	Bacillus subtilis	P39755	ndhF NADH dehydrogenase subunit 5 (ndhF) gene, complete cds, alternate gene name
Contig344D	2125903_f2_88	1112	3949	1239	413	197	5.20E-13	Pyrococcus horikoshii	d1027783	PHLA010413aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 588982-607168 nt position, clone
Contig344D	2142316_f2_76	1113	3950	213	71					
Contig344D	21525051_f1_11	1114	3951	309	103					
Contig344D	21594202_f1_23	1115	3952	1176	392	591	1.50E-57	Bacillus subtilis	P54166	ypfP cell wall synthesis homolog ypfP Bacillus subtilis (YAC10-9 clone) DNA region between the serA and kdg loci, putative

Contig344D	21733125_c3_253	1116	3953	1194	398	664	1.60E-79	Bacillus subtilis	e1181495	dppCDppCBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.alternate gene name
Contig344D	22305342_f2_75	1117	3954	543	181	156	5.20E-10	Kaposi's sarcoma-associated herpes-like virus	g1633572	Kaposi's sarcoma-associated herpes-like virus ORF73 homolog gene, complete cds.Herpessvirus saimiri ORF73 homolog
Contig344D	23484678_c2_246	1118	3955	1731	577	1263	9.00E-129	Bacillus subtilis	P09122	dnaHDNA polymerase III subunitB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig344D	23556500_f3_116	1119	3956	282	94					
Contig344D	23634641_c2_206	1120	3957	1248	416	1475	3.10E-151	Bacillus subtilis	e1183137	yjaY3-oxoacyl- acyl-carrier protein synthase homolog yjaYBacillus subtilis complete genome (section 6 of 21)similar to 3-oxoacyl- acyl-carrier protein
Contig344D	23678800_c1_172	1121	3958	399	133	395	8.60E-37	Bacillus subtilis	e261991	putative orfYitWB.subtilis nprB gene.similar to hypothetical proteins
Contig344D	23861318_f3_155	1122	3959	210	70					
Contig344D	24016916_c3_285	1123	3960	1044	348	396	6.70E-37	Escherichia coli	P33019	yeiHhypothetical 36.9 kD protein in lysP-nfoEscherichia coli K-12 MG1655 section 195 of 400 of the completegenome.o349; 100 pct identical to YEIH_ECOLI SW
Contig344D	24022191_f1_45	1124	3961	222	74	97	3.20E-05	Bacillus subtilis	e1183130	yjzDhypothetical protein yjzDBacillus subtilis complete genome (section 6 of 21)unnamed protein product
Contig344D	24024142_c3_260	1125	3962	315	105	93	8.60E-05	Bacillus firmus	g2654481	hypothetical 10.1 kDa proteinBacillus firmus hypothetical 34.0 kDa protein, hypothetical 8.9 kDaprotein, hypothetical 10.1 kDa protein, hypothetical 21.0 kDaprotein, putative thiosulfate sulfurtransferase, hypothetical 16.1kDa transcriptional regulator an
Contig344D	24272337_f2_74	1126	3963	432	144					
Contig344D	24391885_f2_65	1127	3964	183	61					

Contig344D	24409428_c2_227	1128	3965	258	86	357	9.10E-33	Staphylococcus aureus	g1731452	prerecombination proteinStaphylococcus aureus chloramphenicol resistance plasmid pKH7, complete sequence.
Contig344D	24412517_c1_181	1129	3966	393	131	213	9.90E-17	Bacillus subtilis	P54547	yqjYqjJBacillus subtilis DNA, 283 Kb region containing skin element similar to glucose-6-phosphate 1-dehydrogenase
Contig344D	24415632_c2_203	1130	3967	579	193	827	1.40E-82	Staphylococcus aureus	g1595810	spsBtype-I signal peptidase SpsBStaphylococcus aureus type-I signal peptidase SpsA (spsA) gene, and type-I signal peptidase SpsB (spsB) gene, complete cds.signal peptidase, leader peptidase, serine
Contig344D	24646886_c1_185	1131	3968	1557	519	285	3.00E-22	Helicobacter pylori	g2313187	HP01042',3'-cyclic-nucleotide 2'-phosphodiesteraseHelicobacter pylori section 10 of 134 of the complete genome similar to EGAD
Contig344D	24648412_c2_211	1132	3969	642	214	683	2.60E-67	Bacillus subtilis	e1183180	yjbMGTP pyrophosphokinase homolog yjbMBacillus subtilis complete genome (section 7 of 21) similar to GTP pyrophosphokinase
Contig344D	24664802_c2_237	1133	3970	747	249	380	3.30E-35	Bacillus subtilis	e1186050	yvaKcarboxylesterase homolog yvaKBacillus subtilis complete genome (section 18 of 21) similar to carboxylesterase
Contig344D	24804677_c1_187	1134	3971	366	122	117	1.20E-06	Pseudomonas syringae	g2541936	Pseudomonas syringae phaseolotoxin operonORF6; similar to Pseudomonas syringae fatty acid
Contig344D	25392826_f1_26	1135	3972	1146	382	557	5.80E-54	Bacillus subtilis	e1184257	yueF conserved hypothetical protein yueFBacillus subtilis complete genome (section 17 of 21) similar to hypothetical proteins
Contig344D	25429512_c1_184	1136	3973	1392	464	1130	1.10E-114	Bacillus subtilis	e1184940	ykrMNa+-transporting ATP synthase homolog ykrMBacillus subtilis complete genome (section 8 of 21) similar to Na+-transporting ATP synthase
Contig344D	25586693_c3_287	1137	3974	333	111	374	1.40E-34	Bacillus subtilis	P24281	yaaKunknownB. subtilis DNA, 180 kilobase region of replication origin.ORF107

Contig344D	256468_c2_242	1138	3975	330	110	308	1.40E-27	Bacillus subtilis	e1183178	yjbKhypothetical protein yjbKBacillus subtilis complete genome (section 7 of 21)
Contig344D	26212787_f2_91	1139	3976	612	204					
Contig344D	26377340_c3_256	1140	3977	999	333	208	3.90E-15	Lactococcus lactis	e257629	transcription factorL. lactis ORF, genes homologous to vsf-1 and pepF2 and gene encoding protein homologous to methytransferase.weak homology with vsf-1 gene (X73635)
Contig344D	26460887_f3_117	1141	3978	1524	508	366	5.90E-32	Bacillus subtilis	P13484	tagEUDP-glucoseBacillus subtilis rodC operon.rodD (gtaA) polypeptide (AA 1-673)
Contig344D	26564012_c3_251	1142	3979	2616	872	2649	1.20E-275	Lactococcus lactis subsp. cremoris	g3150046	clpBClpB chaperone homologLactococcus lactis cremoris ClpB chaperone homolog (clpB) andphosphoribosylformylglycinamide cyclo-ligase (pur5) genes, completecds; and phosphoribosylglycinamide formyltransferase (pur3) gene,partial cds.
Contig344D	26604662_c3_259	1143	3980	630	210					
Contig344D	26776562_c1_194	1144	3981	399	133					
Contig344D	289802_f1_41	1145	3982	189	63					
Contig344D	2922260_c1_178	1146	3983	384	128	174	2.20E-13	Bacillus subtilis	e1183179	yjbLhypothetical protein yjbLBacillus subtilis complete genome (section 7 of 21)
Contig344D	30265952_c3_280	1147	3984	387	129	118	1.90E-07	Methanobacterium thermoautotrophicum	g2621161	MTH122mutator MutT related proteinMethanobacterium thermoautotrophicum from bases 68653 to 79584(section 7 of 148) of the complete genome.Function Code
Contig344D	30664130_f3_120	1148	3985	258	86					
Contig344D	30682802_c1_196	1149	3986	261	87					
Contig344D	32062875_c2_228	1150	3987	291	97	333	3.20E-30	Staphylococcus aureus	g1731452	prerecombination proteinStaphylococcus aureus chloramphenicol resistance plasmid pKH7,complete sequence.

Contig344D	32067937_f1_53	1151	3988	1365	455	1790	1.30E-184	Staphylococcus aureus	g2792490	coenzyme A disulfide reductaseStaphylococcus aureus coenzyme A disulfide reductase gene, completecds.CoADR; flavoenzyme (FAD); single catalytic cysteine
Contig344D	32457312_c3_262	1152	3989	495	165	233	1.30E-19	Clostridium perfringens	e303881	putative transposaseC.perfringens uapC, cpe, and nadC genes.
Contig344D	32635937_c2_224	1153	3990	1503	501	895	8.90E-90	Bacillus subtilis	Q03523	murEUDP-N-acetyl muramoyl lananine-D-glutamate-2,6-B.subtilis genes spoVD, murE, mraY, murD.
Contig344D	33364067_c2_226	1154	3991	1782	594	542	2.30E-52	Streptococcus pneumoniae	g2109443	sphraputative serine proteaseStreptococcus pneumoniae R801 tRNA-Arg gene, partial sequence, and putative serine protease (sphtra), SPSPoJ (spspoJ), initiator protein (spdnaa) and beta subunit of DNA polymerase III (spdnan)genes, complete cds.SPHtra
Contig344D	33399055_c3_275	1155	3992	393	131	419	2.40E-39	Bacillus subtilis	e1182121	ybc1hypothetical protein ybc1Bacillus subtilis complete genome (section 1 of 21)
Contig344D	3371067_c3_254	1156	3993	954	318	1033	2.10E-104	Bacillus subtilis	g143608	spo0KEsporulation proteinBacillus subtilis spo0K operon.inner membrane protein malK
Contig344D	34062930_c2_229	1157	3994	273	91	290	1.10E-25	Plasmid pT181	P03864	Plasmid pT181, complete genome.Pre protein (plasmid recombination)
Contig344D	34073552_c3_266	1158	3995	1545	515	1235	8.30E-126	Dichelobacter nodosus	P39883	prfCPrfC/RF3Dichelobacter nodosus A198 LpsA (lpsA), putative peptide releasefactor 3 (prfC), and putative amino acid binding protein (aabA)genes, complete cds.peptide release factor 3 (putative)
Contig344D	34163562_f2_89	1159	3996	486	162	329	8.40E-30	Bacillus subtilis	e209890	adhBNAD alcohol dehydrogenaseB.subtilis 23.9kb fragment from map position 233 degrees on thechromosome.
Contig344D	34407625_c1_189	1160	3997	354	118	587	3.90E-57	Staphylococcus lugdunensis	g1658281	CadXStaphylococcus lugdunensis strain 995 cadmium resistance plasmidpLUG10, complete sequence.

Contig344D	34407888_c1_177	1161	3998	729	243	288	1.60E-37	Bacillus firmus	g2932027	mecA MecA homolog Bacillus firmus synthase (cls) genes, complete cds.
Contig344D	35158177_c2_213	1162	3999	1407	469	855	1.50E-85	Bacillus subtilis	e1181529	ykoK YkoK Bacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR. homologous to magnesium transporters
Contig344D	35937827_c3_264	1163	4000	510	170	343	2.80E-31	Bacillus subtilis	e1183205	yjgG hypothetical protein yjgG Bacillus subtilis complete genome (section 7 of 21)
Contig344D	36134717_c2_208	1164	4001	1647	549	889	3.80E-89	Plasmid pAD1	g388269	traCpheromone cAD1 binding protein precursor Plasmid pAD1 (from Enterococcus faecalis strain
Contig344D	36227142_c2_240	1165	4002	993	331	409	2.80E-38	Bacillus subtilis	P54421	papQ phosphatase-associated protein Bacillus subtilis phosphatase- associated protein (papQ) gene, complete cds. Muralytic when cloned in E.coli; lap60 homolog.
Contig344D	36229625_f2_81	1166	4003	204	68	195	1.30E-15	Bacillus subtilis	e1184971	ykvS hypothetical protein ykvS Bacillus subtilis complete genome (section 8 of 21)
Contig344D	36568828_c3_272	1167	4004	1050	350	984	3.30E-99	Clostridium perfringens	A43577	regulatory protein pfoR
Contig344D	36593802_c3_278	1168	4005	867	289	454	4.80E-43	Pasteurella haemolytica	Q08868	PLP ALipoprotein Pasteurella haemolytica lipoprotein gene, complete cds. lipoprotein- 28 precursor
Contig344D	36611062_c1_170	1169	4006	420	140	174	2.20E-13	Bacillus subtilis	e1183078	yisL YisL Bacillus subtilis complete genome (section 6 of 21) putative
Contig344D	3944143_c1_188	1170	4007	627	209	971	7.80E-98	Staphylococcus aureus	g1916729	cadC CadD Staphylococcus aureus plasmid pRW001, cadmium resistance CadD (cadD) gene, complete cds. contains 5 transmembrane domains; confers low level
Contig344D	3954718_c2_204	1171	4008	3489	1163	1331	5.60E-136	Bacillus subtilis	P23477	addA ATP-dependent nuclease Bacillus subtilis ATP-dependent nuclease (addA) and (addB), and open reading frame 3, partial cds. TTG start; see ref [3]

Contig344D	4019193_c2_219	1172	4009	783	261	749	2.60E-74	Bacillus subtilis	e1183192	yjbWenoyl- acyl-carrier protein reductase homolog yjbWBacillus subtilis complete genome (section 7 of 21)similar to enoyl-acyl-carrier protein reductase
Contig344D	4064818_c2_239	1173	4010	675	225	533	2.00E-51	Escherichia coli	P31547	yaeHypothetical 23.3 kd proteinEscherichia coli K-12 MG1655 section 19 of 400 of the completegenome.f218; 100 pet identical to YAEH_ECOLI SW
Contig344D	4070151_c3_248	1174	4011	447	149	165	2.00E-12	Bacillus subtilis	e1173495	AddAB.subtilis 54kb genomic DNA fragment.
Contig344D	4080443_c2_214	1175	4012	1854	618	1574	9.90E-162	Bacillus subtilis	e1183184	yjbQNa+/H+ antiporter homolog yjbQBacillus subtilis complete genome (section 7 of 21)similar to Na+/H+ antiporter
Contig344D	4082828_c1_195	1176	4013	702	234	207	7.10E-17	Helicobacter pylori	g2313985	HP0851 conserved hypothetical integral membraneHelicobacter pylori section 74 of 134 of the complete genome.similar to EGAD
Contig344D	4088962_c3_265	1177	4014	279	93					trpTryptophanyl-tRNA synthetaseB.subtilis trpS gene encoding tryptophanyl-tRNA synthetase,complete cds. tryptophan--tRNA ligasetryptophanyl-tRNA synthetase (EC 6.1.1.2)
Contig344D	4094433_f3_154	1178	4015	999	333	1184	2.10E-120	Bacillus subtilis	P21656	
Contig344D	40957_c2_212	1179	4016	858	286	513	2.70E-49	Bacillus subtilis	e1183182	yjbOConserved hypothetical protein yjbOBacillus subtilis complete genome (section 7 of 21)similar to hypothetical proteins
Contig344D	4173410_c3_263	1180	4017	792	264	485	2.50E-46	Bacillus subtilis	e1183206	yjcHypothetical protein yjcHBacillus subtilis complete genome (section 7 of 21)
Contig344D	4322752_f3_121	1181	4018	207	69	93	8.60E-05	Pyrococcus horikoshii	d1028459	PHAU021101aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1195819-1238496 nt position,clone
Contig344D	4328468_c2_243	1182	4019	1473	491	1279	1.80E-130	Bacillus subtilis	e1183502	gluHglutamate synthase (small subunit)Bacillus subtilis complete genome (section 10 of 21)





Contig344D	7228438_c3_247	1200	4037	3231	1077	1793	6.20E-185	Bacillus subtilis	P23478	addBA ATP-dependent nuclease Bacillus subtilis ATP-dependent nuclease (addA) and (addB), and open reading frame 3, partial cds, alternate gene name
Contig344D	7308375_c1_173	1201	4038	942	314	791	9.30E-79	Bacillus subtilis	e1183164	oppB oligopeptide ABC transporter (permease) Bacillus subtilis complete genome (section 7 of 21) alternate gene name
Contig344D	782816_c2_205	1202	4039	1857	619	776	3.10E-116	Bacillus subtilis	g1934616	YrhL hypothetical protein YrhL Bacillus subtilis cysteine synthase (YrhA), cystathionine gamma-lyase (YrhB), YrhC (YrhC), YrhD (YrhD), formate dehydrogenase chain A (YrhE), YrhF (YrhF), formate dehydrogenase (YrhG), YrhH (YrhH), regulatory protein (YrhI), cyto
Contig344D	819056_f1_55	1203	4040	189	63					
Contig344D	859838_f2_98	1204	4041	384	128					
Contig344D	984703_c3_277	1205	4042	1026	342	763	8.60E-76	Escherichia coli	P30750	abcA ATP-binding protein Escherichia coli K-12 MG1655 section 19 of 400 of the complete genome.malK protein homology f343; 98 pct identical to fragment (231 aa)
Contig344D	985887_c1_175	1206	4043	435	145	570	2.40E-55	Bacillus subtilis	e1183170	yjdB conserved hypothetical protein yjdB Bacillus subtilis complete genome (section 7 of 21) similar to hypothetical proteins
Contig345D	12697136_c3_28	1207	4044	873	291	1519	6.70E-156	Staphylococcus epidermidis	g1161381	icaB1caB Staphylococcus epidermidis operon mediating intercellular adhesion
Contig345D	15126592_c1_19	1208	4045	1086	362	1831	5.80E-189	Staphylococcus epidermidis	g1161382	icaC1caC Staphylococcus epidermidis operon mediating intercellular adhesion
Contig345D	23445387_f2_5	1209	4046	195	65					
Contig345D	24406542_c1_18	1210	4047	339	113	513	2.70E-49	Staphylococcus epidermidis	g2914128	icaD1caD Staphylococcus epidermidis operon mediating intercellular adhesion
Contig345D	24421937_f2_6	1211	4048	1269	423	778	2.20E-77	Bacillus subtilis	e1182844	yfhI antibiotic resistance protein homolog yfhI Bacillus subtilis complete genome (section 5 of 21) similar to antibiotic resistance protein
Contig345D	25675155_c3_24	1212	4049	1521	507					
Contig345D	33203385_f2_4	1213	4050	597	199	967	2.10E-97	Staphylococcus epidermidis	g2978430	icaR1caR Staphylococcus epidermidis operon mediating intercellular adhesion

Contig345D	35995316_c2_21	1214	4051	1257	419	2160	7.90E-224	Staphylococcus epidermidis	g1161380	icaAicaAS	Staphylococcus epidermidis operon mediating intercellular adhesion
Contig345D	4004643_c1_11	1215	4052	201	67						
Contig345D	53413_c3_25	1216	4053	1602	534	424	7.20E-40	Helicobacter pylori	g2313187	HP01042', 3'-cyclic-nucleotide 2'-phosphodiesterase	Helicobacter pylori section 10 of 134 of the complete genome, similar to EGAD
Contig345D	6350031_f1_1	1217	4054	2100	700	3598	0	Staphylococcus epidermidis	g2981225	geh1 lipase precursor	Staphylococcus epidermidis lipase precursor (geh1) gene, complete cds.
Contig346D	10317307_f1_38	1218	4055	267	89						
Contig346D	10626525_f3_105	1219	4056	1023	341	810	9.00E-81	Bacillus subtilis	e1183034	yhfPhy	hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hypothetical proteins
Contig346D	10662763_c1_136	1220	4057	1089	363	688	7.60E-68	Bacillus subtilis	Q06754	yacL	Unknown B. subtilis DNA, 180 kilobase region of replication origin, similar to hypothetical proteins
Contig346D	10928_c1_131	1221	4058	1242	414	230	1.00E-16	Rhodobacter capsulatus	g3128293	hypothetical protein	Rhodobacter capsulatus strain SB1003, partial genome.
Contig346D	10976625_c3_190	1222	4059	888	296	870	4.00E-87	Bacillus subtilis	e1183045	yhx	Dhypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to ribitol dehydrogenase
Contig346D	11114677_f3_87	1223	4060	204	68						
Contig346D	11740778_f1_21	1224	4061	216	72						
Contig346D	1207250_c1_122	1225	4062	480	160						
Contig346D	13695125_c1_140	1226	4063	603	201	117	7.80E-06	Clostridium acetobutylicum	g3025463	sigXSigX	Clostridium acetobutylicum pho-sigX gene region, phoP, phoR, sigX, orf36, and orf18 genes, complete cds, proposed ECF subfamily RNA polymerase sigma factor
Contig346D	14644018_f3_98	1227	4064	969	323	324	2.90E-29	Staphylococcus epidermidis	g2196513	epiH	putative membrane proteinStaphylococcus epidermidis plasmid pTue32 putative ABC transportersubunits (epiG), (epiE), and (epiF), putative membrane protein(epiH), EpiT' (epiT') and EpiT'' (epiT'') genes, complete cds.EpiH
Contig346D	14656952_f1_24	1228	4065	633	211						
Contig346D	15035952_f1_23	1229	4066	477	159						

Contig346D	15117317_c3_176	1230	4067	2184	728	953	2.00E-102	Bacillus subtilis	P13485	tagFCDP-glycerolBacillus subtilis rodC operon.rodC (tag3) polypeptide (AA 1-746)
Contig346D	15136562_c3_179	1231	4068	1500	500	1307	1.90E-133	Escherichia coli	P33940	yohHyojH proteinE.coli genomic DNA, Kohara clone #373(49,5-49,9 min.).ORF_ID
Contig346D	15804076_f2_61	1232	4069	1557	519	903	1.30E-90	Bacillus subtilis	P94524	araBL-ribulokinaseBacillus subtilis complete genome (section 15 of 21)homology to araB of Escherichia coli;identified on
Contig346D	15829135_c3_173	1233	4070	204	68	105	8.40E-06	Bacillus subtilis	e1182361	ynlHypothetical protein ycnlBacillus subtilis complete genome (section 3 of 21)
Contig346D	16681687_c3_192	1234	4071	1029	343	694	1.80E-68	Bacillus subtilis	P37570	yacLunkownB. subtilis DNA, 180 kilobase region of replication origin.similar to creatine kinase
Contig346D	16836012_c1_130	1235	4072	519	173					
Contig346D	16972575_f2_48	1236	4073	186	62					
Contig346D	174218_c2_153	1237	4074	1989	663	1225	9.50E-125	Bacillus subtilis	e1182890	yhcAmultidrug resistance protein homolog yhcABacillus subtilis complete genome (section 5 of 21)similar to multidrug resistance protein
Contig346D	179653_c2_162	1238	4075	666	222					
Contig346D	1970178_f1_19	1239	4076	219	73					
Contig346D	19742962_c3_187	1240	4077	1026	342	267	3.10E-23	Acinetobacter calcoaceticus	P05149	MROaldose 1-epimerase,Acinetobacter calcoaceticus gene for mutarotase (EC 5.1.3.3.) precursor (aa -20 to 381)
Contig346D	20500938_f3_100	1241	4078	228	76					
Contig346D	20580443_c1_120	1242	4079	333	111	165	2.00E-12	Bacillus sphaericus	P39044	Xgene X proteinB.sphaericus gene for ribosomal protein S14 homologue.
Contig346D	20897125_c2_155	1243	4080	975	325	504	2.40E-48	Bacillus subtilis	e1182790	yfjQYfjQBacillus subtilis complete genome (section 5 of 21)similar to divalent cation transport protein
Contig346D	20980262_c1_135	1244	4081	2472	824	2959	0	Bacillus subtilis	P37571	mecBclpA/clpB familyB. subtilis DNA, 180 kilobase region of replication origin.ATP-dependent Clp proteinase chain Aalternate gene name

Contig346D	22277215_f1_15	1245	4082	1164	388	109	1.20E-05	Plasmodium <i>falciparum</i>	C44863	R45 antigen
Contig346D	22455213_f2_68	1246	4083	687	229	411	1.70E-38	Thermotoga <i>maritima</i>	g1575577	drdADNA-binding response regulatorThermotoga maritima DNA- binding response regulator (drdA) andhistidine protein kinase (hpkA) genes, complete cds.thymidine/pyrimidine phosphorylase homolog gene, partial cds.complete cds.DrrA; OmpR/PhoB subfamily response
Contig346D	22689067_f2_54	1247	4084	1221	407	1218	5.30E-124	Bacillus subtilis	P39141	nupCpyrimidine nucleoside transport proteinBacillus subtilis genome sequence between the iol and hut operon,partial and complete cds.
Contig346D	22867942_c3_188	1248	4085	711	237	411	1.70E-38	Pyrococcus <i>horikoshii</i>	d1024727	PHAA004229aa long hypothetical ribose- 5-phosphatePyrococcus horikoshii OT3 PHAA001-PHAA055 genes, complete cds.similar to PIR
Contig346D	22869687_c2_144	1249	4086	438	146	143	4.30E-10	Escherichia coli	g1788146	hypothetical protein b1841Escherichia coli K-12 MG1655 section 168 of 400 of the completegenome.fl24; This 124 aa ORF is 39 pct identical (6 gaps)
Contig346D	23556552_c3_174	1250	4087	405	135	123	5.70E-08	Chloroplast Porphyra purpurea	P51192	ORF174hypothetical protein 174Porphyra purpurea chloroplast, complete genome.
Contig346D	23601557_f2_58	1251	4088	201	67					
Contig346D	23601577_f1_17	1252	4089	186	62					
Contig346D	23704678_f3_95	1253	4090	216	72					
Contig346D	23839193_c2_147	1254	4091	1614	538	1324	3.10E-135	Bacillus subtilis	e1182258	lctPL-lactate permeaseBacillus subtilis complete genome (section 2 of 21)alternate gene name
Contig346D	23923412_f3_94	1255	4092	225	75					
Contig346D	24267567_f2_65	1256	4093	645	215					
Contig346D	24407327_c3_195	1257	4094	696	232	892	1.80E-89	Bacillus subtilis	e1182036	rplArribosomal protein L1 (BL1)Bacillus subtilis complete genome (section 1 of 21)
Contig346D	24407827_c3_185	1258	4095	561	187					

Contig346D	24412826_c2_161	1259	4096	963	321	286	3.00E-25	Klebsiella aerogenes	P19452	HUTGK.aerogenes histidine utilization repressor C (hutC) gene, complete cds.histidine utilization repressor G
Contig346D	24415925_c2_154	1260	4097	903	301	282	8.10E-25	Acinetobacter lwoffii	g1209223	esteraseAcinetobacter lwoffii orf1 and esterase (est) genes, complete cds.
Contig346D	245953_c2_164	1261	4098	579	193	231	2.00E-19	Listeria monocytogenes	g1314295	Listeria monocytogenes ClpC ATPase (mec) gene, complete cds. ORF2; putative 19 kDa protein
Contig346D	24662825_c1_127	1262	4099	618	206	538	6.00E-52	Bacillus subtilis	e1184514	ywrFhypothetical protein ywrFBacillus subtilis complete genome (section 19 of 21)
Contig346D	2470010_c2_146	1263	4100	723	241	150	3.10E-08	Dictyostelium discoideum	g2952545	DB10coronin binding proteinDictyostelium discoideum coronin binding protein (DB10) mRNA, complete cds.
Contig346D	24803386_c2_150	1264	4101	1080	360	215	2.00E-15	Mycobacterium tuberculosis	Q50735	MTCY9C4.05cunknownMycobacterium tuberculosis cosmid
Contig346D	25527188_c3_189	1265	4102	1137	379	829	8.80E-83	Bacillus subtilis	g2293256	hipOputative hippurate hydrolaseBacillus subtilis rrmB-dnaB genomic region.
Contig346D	25551640_c2_157	1266	4103	861	287					
Contig346D	25579390_f3_101	1267	4104	1194	398	402	7.10E-37	Streptomyces coelicolor	e1294490	SC1C3.12putative transferaseStreptomyces coelicolor cosmid 1C3.SC1C3.12, possible transferase, len
Contig346D	25667753_c1_141	1268	4105	564	188	906	6.10E-91	Staphylococcus carnosus	P36264	nusGtranscription antitermination factor nusGS.carnosus secE, nusG and rplK genes.transcription antitermination factor nusG
Contig346D	26206687_c3_194	1269	4106	210	70	278	2.10E-24	Staphylococcus aureus	g2078376	secESecStaphylococcus aureus NCTC 8325 SecE (secE), NusG (nusG) and RplK(rplK) genes, complete cds...

Contig346D	26753588_f3_99	1270	4107	1383	461	344	2.20E-31	Bacillus subtilis	e1182343	yeKhomologue of alkaline phosphatase synthesisBacillus subtilis complete genome (section 3 of 21)similar to two-component sensor histidine kinase
Contig346D	26854757_c2_167	1271	4108	660	220	975	3.00E-98	Staphylococcus xylosus	P77985	cysEserine O-acetyltransferaseS.xylosus cysE gene, genomic region.
Contig346D	29565627_c1_108	1272	4109	879	293					
Contig346D	31256916_c1_142	1273	4110	507	169	681	4.20E-67	Staphylococcus carnosus	P36254	rplKL11 proteinS.carnosus secE, nusG and rplK genes.Escherichia coli ribosomal protein L11
Contig346D	3134386_f1_2	1274	4111	228	76					
Contig346D	34199202_c2_145	1275	4112	540	180	343	2.80E-31	Bacillus subtilis	e1184294	paiaTranscriptional regulatorBacillus subtilis complete genome (section 17 of 21)
Contig346D	34610667_c1_114	1276	4113	690	230	465	3.30E-44	Archaeoglobus fulgidus	g2649576	AF1018ABC transporter, ATP-binding proteinArchaeoglobus fulgidus section 74 of 172 of the complete genome.similar to GB
Contig346D	35159528_c3_169	1277	4114	732	244	942	9.30E-95	Staphylococcus xylosus	P51184	scrAEIscrS.xylosus scrA gene and unidentified open reading frames.phosphotransferase system sucrose-specific enzyme II, factor IIORF2
Contig346D	35162800_c2_166	1278	4115	1506	502	1701	3.50E-175	Bacillus subtilis	P22250	gluXglutamyl-tRNA synthetaseB. subtilis DNA, 180 kilobase region of replication origin.glutamate-tRNA ligase
Contig346D	36134715_c2_168	1279	4116	771	257	666	1.60E-65	Bacillus subtilis	Q06753	yaOUnknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig346D	36140963_f1_37	1280	4117	1431	477	226	1.60E-15	Bacillus subtilis	P13485	tagFCDP-glycerolBacillus subtilis rodC operon.rodC (tag3) polypeptide (AA 1-746)
Contig346D	4062562_c3_186	1281	4118	183	61					
Contig346D	4382062_f3_91	1282	4119	189	63					
Contig346D	4496062_c1_109	1283	4120	345	115	168	9.70E-13	Bacillus subtilis	e1182361	ycnIhypothetical protein ycnIBacillus subtilis complete genome (section 3 of 21)

Contig346D	4687893_c2_156	1284	4121	1059	353	523	2.30E-50	Halobacterium sp. NRC-1	g2822338	Halobacterium sp. NRC-1 plasmid pNRC100, complete plasmid sequence. ORF H0660; similar to ORF in Sulfolobus
Contig346D	4727217_c3_93	1285	4122	402	134					
Contig346D	4881588_c3_181	1286	4123	465	155	134	3.90E-09	Bacillus subtilis	d1020150	ydgG transcriptional regulator (MarR family) homolog ydgGBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN.
Contig346D	5128587_c2_59	1287	4124	696	232	336	1.50E-30	Bacillus subtilis	e1182755	yTKY1K Bacillus subtilis complete genome (section 5 of 21) similar to hypothetical proteins
Contig346D	5283390_c3_182	1288	4125	1416	472	131	5.60E-05	Mycoplasma hominis	g587472	Imp2M.hominis Imp1 and Imp2 genes.
Contig346D	6149152_c2_165	1289	4126	1389	463	1543	1.90E-158	Bacillus subtilis	P37572	smsunknownB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig346D	6443763_c1_138	1290	4127	408	136	298	1.60E-26	Bacillus subtilis	e1182028	yazC conserved hypothetical protein yazCBacillus subtilis complete genome (section 1 of 21) similar to hypothetical proteins
Contig346D	661062_c3_193	1291	4128	1440	480	1568	4.30E-161	Bacillus subtilis	Q06752	cysScysteinyI-tRNA synthetaseB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name
Contig346D	6725707_c1_139	1292	4129	552	184	327	1.40E-29	Bacillus subtilis	P37574	yacPunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig346D	6930462_c3_183	1293	4130	1227	409	634	4.00E-62	Bacillus subtilis	d1020154	ydgKbicyclomycin resistance protein homolog ydgKBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.SIMILAR TO BICYCLOMYCIN RESISTANCE PROTEIN.
Contig346D	7229680_c3_191	1294	4131	492	164	377	6.90E-35	Bacillus subtilis	P37568	cisRunknownB. subtilis DNA, 180 kilobase region of replication origin.alternate gene name

Contig346D	7242812_f2_62	1295	4132	627	209	373	1.80E-34	Bacillus subtilis	e1186361	yxjDNA-3-methyladenine glycosidase homolog yxjBacillus complete genome (section 20 of 21) similar to DNA-3-methyladenine glycosidase orfALactococcus lactis pfl gene (strain DB1341).
Contig346D	804837_f3_106	1296	4133	963	321	342	3.50E-31	Lactococcus lactis	e327689	
Contig346D	814838_c2_152	1297	4134	660	220	472	5.90E-45	Bacillus subtilis	e1182889	yhbJhypothetical protein yhbJ/Bacillus subtilis complete genome (section 5 of 21)
Contig346D	837578_c2_163	1298	4135	1233	411	708	5.80E-70	Borrelia burgdorferi	g2688567	BB0637Na+/H+ antiporter (nhaC-1) Borrelia burgdorferi (section 51 of 70) of the complete genome. similar to GB
Contig346D	8568_c1_110	1299	4136	429	143					
Contig346D	901515_c2_159	1300	4137	285	95					
Contig346D	990952_f2_63	1301	4138	1209	403	732	1.70E-72	Helicobacter pylori	g2314680	HP1506glutamate permease (gltS) Helicobacter pylori section 126 of 134 of the complete genome. sodium--glutamate symport carrier proteins similar to EGAD
Contig346D	9924055_c1_137	1302	4139	216	72					
Contig346D	9944132_f3_92	1303	4140	189	63					
Contig347D	10657925_c1_52	1304	4141	948	316	573	1.20E-55	Bacillus subtilis	e1184303	thrBhomoserine kinase Bacillus subtilis complete genome (section 17 of 21) alternate gene name
Contig347D	10975428_f1_5	1305	4142	879	293					
Contig347D	1212785_f3_33	1306	4143	213	71					
Contig347D	1382052_c1_53	1307	4144	189	63					
Contig347D	14901512_c1_49	1308	4145	552	184	500	6.40E-48	Staphylococcus intermedius	P43269	nucleomucaseS.intermedius nuc gene for thermomucase.
Contig347D	19953281_c1_51	1309	4146	1347	449	822	4.80E-82	Bacillus subtilis	P19582	homomoserine dehydrogenase Bacillus subtilis homoserine dehydrogenase (hom) gene, complete cds, threonine synthase (thrC) gene, 5' end of cds. homoserine dehydrogenase
Contig347D	20370457_c3_71	1310	4147	183	61					
Contig347D	20485875_c1_45	1311	4148	231	77					



Contig347D	20745462_c2_56	1312	4149	1257	419	862	2.80E-86	Bacillus subtilis	g1750108	ynbA YnbA Bacillus subtilis SpoVK (spoVK), YnbA (ynbA), YnbB (ynbB), GlnR (glnR), glutamine synthetase (glnA), YnaA (ynaA), YnaB (ynaB), YnaC (ynaC), YnaD (ynaD), YnaE (ynaE), YnaF (ynaF), YnaG (ynaG), YnaH (ynaH), YnaI (ynaI), YnaJ (ynaJ), xylan beta-1,4-xylo
Contig347D	21751938_f2_22	1313	4150	708	236	183	2.50E-14	Streptococcus thermophilus bacteriophage TP-J34	g2897104	putative host cell surface-exposed lipoprotein Streptococcus thermophilus bacteriophage lysogeny module, integrase homolog (int), putative host cell surface-exposed lipoprotein, putative metallo-proteinase, repressor, Cro-like regulatory protein, and PI-antir
Contig347D	22539812_c2_57	1314	4151	1254	418	1290	1.20E-131	Bacillus subtilis	g1750109	ynbB YnbB Bacillus subtilis SpoVK (spoVK), YnbA (ynbA), YnbB (ynbB), GlnR (glnR), glutamine synthetase (glnA), YnaA (ynaA), YnaB (ynaB), YnaC (ynaC), YnaD (ynaD), YnaE (ynaE), YnaF (ynaF), YnaG (ynaG), YnaH (ynaH), YnaI (ynaI), YnaJ (ynaJ), xylan beta-1,4-xylo
Contig347D	23557807_f1_12	1315	4152	534	178	506	1.50E-48	Lactococcus lactis	e1172770	gpglutathione peroxidase Lactococcus lactis carB and gpo genes.
Contig347D	24017127_c2_58	1316	4153	405	135	537	7.70E-52	Staphylococcus aureus	g468509	glnR glutamine synthetase repressor S.aureus (bb270) glnA and glnR genes.
Contig347D	24078753_c1_41	1317	4154	450	150	295	3.40E-26	Bacillus subtilis	e1183392	miaA tRNA isopentenyl pyrophosphate transferase Bacillus subtilis complete genome (section 10 of 21)
Contig347D	24352200_f2_21	1318	4155	1095	365	674	2.30E-66	Leishmania major	g2266911	L4171-60L leishmania major strain Freidlin chromosome 1 cosmid clone L4171. contains leucine zipper

Contig347D	24412811_c1_40	1319	4156	957	319	147	3.70E-11	Oryza sativa	g2801536	LPL1 lysophospholipase homolog Oryza sativa lysophospholipase homolog (LPL1) mRNA, complete cds.
Contig347D	24414187_c1_43	1320	4157	396	132					
Contig347D	24495928_c2_60	1321	4158	210	70					
Contig347D	24631637_c1_42	1322	4159	708	236	236	6.00E-20	Streptococcus thermophilus	g2444107	ORF28 Streptococcus thermophilus bacteriophage 01205 DNA sequence.
Contig347D	24877312_f3_32	1323	4160	1392	464	1093	9.30E-111	Bacillus subtilis	e1182346	yclM homologue of aspartokinase 2 alpha and beta Bacillus subtilis complete genome (section 3 of 21) similar to homoserine dehydrogenase
Contig347D	25449061_c2_64	1324	4161	249	83	191	3.50E-15	Bacillus subtilis	g2619014	yocG sensor regulator Bacillus subtilis chromosome region between terC and odhAB, similar to B. subtilis Spo0A protein (267 aa)
Contig347D	25626625_c3_74	1325	4162	636	212					
Contig347D	26205387_f1_2	1326	4163	336	112					
Contig347D	26369016_c2_61	1327	4164	387	129	105	4.60E-06	Bacteriophage B1	e139437	b1 (sfp) scaffolding protein Bacteriophage TP901-1 genomic region, putative
Contig347D	29509442_c1_38	1328	4165	720	240	651	6.40E-64	Bacillus subtilis	P18156	glpF glycerol uptake facilitator Bacillus subtilis antiterminator regulatory protein (glpP), glycerol uptake facilitator (glpF) genes, complete cds, glycerol kinase (glpK) gene, 5' end, glycerol facilitator protein putative
Contig347D	30355313_c2_63	1329	4166	1113	371	382	2.00E-35	Bacillus subtilis	g2619013	yocF sensor kinase Bacillus subtilis chromosome region between terC and odhAB, similar to B. subtilis DegS sensor kinase (385 aa)
Contig347D	34070261_c1_47	1330	4167	900	300	386	7.70E-36	Bacillus subtilis	e1186097	yvfR hypothetical protein Bacillus subtilis complete genome (section 18 of 21) similar to ABC transporter (ATP-binding protein)

Contig347D	34195135_c3_77	1331	4168	1104	368	1236	6.50E-126	Bacillus subtilis	P04990	thrC threonine synthaseB. subtilis thrB and thrC genes for homoserine kinase and threonine synthase (EC 2.7.1.39 and EC 4.2.99.2, respectively).threonine dehydratasealternate gene name
Contig347D	36134401_c3_78	1332	4169	831	277	315	2.60E-28	Bacillus subtilis	P54947	yxhH conserved hypothetical protein yxhHBacillus subtilis complete genome (section 21 of 21)similar to hypothetical proteins
Contig347D	4080342_c1_39	1333	4170	1515	505	1998	1.20E-206	Bacillus subtilis	P18157	glpK glycerol kinaseB. subtilis glycerol kinase (glpK) and glycerol-3-phosphatedehydrogenase (glpD) genes, complete cds.xylulokinaseglycerol kinase (glpK) (EC 2.7.1.30)
Contig347D	4891577_c3_69	1334	4171	582	194	453	6.10E-43	Bacillus subtilis	e1183392	miaA RNA isopentenylpyrophosphate transferaseBacillus subtilis complete genome (section 10 of 21)
Contig347D	5109625_c1_48	1335	4172	372	124	258	2.80E-22	Bacillus subtilis	e1186094	yvfU hypothetical proteinBacillus subtilis complete genome (section 18 of 21)similar to two-component response regulator [YvfU]
Contig347D	5355012_c2_59	1336	4173	1359	453	2274	6.60E-236	Staphylococcus aureus	Q59812	glnA glutamine synthetaseS.aureus (bb270) glnA and glnR genes.
Contig347D	5859568_f1_1	1337	4174	357	119	315	4.70E-28	ESCHERICHIA COLI	P25737	LYSP LYSINE-SPECIFIC PERMEASE
Contig347D	6525_f2_13	1338	4175	1035	345	729	3.50E-72	Escherichia coli	g1788480	lysP lysine-specific permeaseEscherichia coli K-12 MG1655 section 195 of 400 of the completegenome.arginine permeasef489; 100 pct identical to LYSP_ECOLI SW
Contig347D	6641963_c1_46	1339	4176	1485	495	1302	6.60E-133	Bacillus subtilis	e1184565	ywnE UnknownBacillus subtilis complete genome (section 19 of 21)similar to cardiolipin synthase
Contig347D	6929677_c2_55	1340	4177	258	86	187	9.40E-15	Bacillus subtilis	e1183393	ymaH host factor-1 protein homolog ymaHBacillus subtilis complete genome (section 10 of 21)similar to host factor-1 protein

Contig347D	869052_c3_68	1341	4178	1677	559	1700	4.40E-175	Bacillus subtilis	P18158	glpDglycerol-3-phosphate dehydrogenaseB.subtilis glycerol kinase (glpK) and glycerol-3-phosphatedehydrogenase (glpD) genes, complete cds.glycerol-3-phosphate dehydrogenase (glpD) (EC
Contig347D	9851507_f2_20	1342	4179	417	139					yvTS hypothetical proteinBacillus subtilis complete genome (section 18 of 21) probable permease
Contig347D	995967_c3_72	1343	4180	747	249	341	4.50E-31	Bacillus subtilis	e1186096	
Contig348D	10578392_f2_26	1344	4181	510	170	525	1.40E-50	Staphylococcus carnosus	g2735511	YwpF homologStaphylococcus carnosus (3R)-hydroxymyristoyl acyl carrier protein dehydrogenase homolog (fabZ) gene, partial cds, YwpF homolog, single-strand binding protein homolog (ssb), SceD precursor (sceD), SceA precursor (sceA) and SceE precursor (sceE) genes
Contig348D	10739063_c1_98	1345	4182	693	231	601	1.30E-58	Staphylococcus carnosus	g2735513	sceDSceD precursorStaphylococcus carnosus (3R)-hydroxymyristoyl acyl carrier protein dehydrogenase homolog (fabZ) gene, partial cds, YwpF homolog, single-strand binding protein homolog (ssb), SceD precursor (sceD), SceA precursor (sceA) and SceE precursor (sceE)
Contig348D	12111018_f3_64	1346	4183	426	142	174	2.20E-13	Azospirillum brasilense	g642965	carRA, brasilense carR gene. ORF2
Contig348D	12142768_f1_23	1347	4184	300	100	110	3.50E-06	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position, clone
Contig348D	1250_c3_151	1348	4185	714	238	644	3.50E-63	Staphylococcus carnosus	g2735516	tenATenA homologStaphylococcus carnosus (3R)-hydroxymyristoyl acyl carrier protein dehydrogenase homolog (fabZ) gene, partial cds, YwpF homolog, single-strand binding protein homolog (ssb), SceD precursor (sceD), SceA precursor (sceA) and SceE precursor (sceE) g

Contig348D	1292842_c2_110	1349	4186	672	224	397	5.30E-37	Bacillus subtilis	e1183028	yhfK hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hypothetical proteins
Contig348D	1366660_c3_136	1350	4187	1215	405	566	6.50E-55	Mycobacterium tuberculosis	e1251137	MTV016.05c putative aminohydrolase Mycobacterium tuberculosis sequence v016.MTV016.05c, len
Contig348D	13790952_c2_114	1351	4188	1194	398	1350	5.40E-138	Bacillus subtilis	d1013330	drnYqkN Bacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig348D	1415877_c2_109	1352	4189	912	304	198	6.70E-16	Methanococcus jannaschii	g1499745	MJ0912 conserved hypothetical protein Methanococcus jannaschii section 77 of 150 of the complete genome. similar to GP
Contig348D	14225327_f1_15	1353	4190	1029	343	867	8.20E-87	Bacillus subtilis	g1934656	yrdO cation transport protein YrdO Bacillus subtilis aminoglycoside 6-adenylyltransferase (aadK) gene, partial cds, and YrdA (yrdA), YrdB (yrdB), hypothetical protein YrdC (yrdC), YrdD (yrdD), hypothetical cytochrome P450 protein YrdE (yrdE), ribonuclease inhi
Contig348D	1438927_c1_85	1354	4191	1686	562	2118	2.20E-219	Bacillus subtilis	P13242	ctrA CTP synthetase Bacillus subtilis spo0F, CTP synthetase (ctrA), and fructose-bisphosphate aldolase (orfY-tsrf) genes, complete cds. CTP synthetase alternate gene name
Contig348D	14849093_c3_129	1355	4192	294	98	127	2.10E-08	Mitochondrion Chondrus crispus	e138028	putative orf79.1C.crispus complete mitochondrial genome. unique orf
Contig348D	16251305_c3_146	1356	4193	786	262	724	1.20E-71	Bacillus stearothermophilus	P42010	ATPBATPase subunit a Bacillus stearothermophilus genes for ATPase subunits a and c, complete cds.
Contig348D	19739675_c3_141	1357	4194	636	212	638	1.50E-62	Bacillus subtilis	Q03221	tdk thymidine kinase Bacillus subtilis OrfR, 3' end; OrfQ; transcriptional terminator (rho) gene; ribosomal protein L31; thymidine kinase (tdk) gene, complete cds. thymidine kinase. incorrect sequence given in Quirk et al. citation,

Contig348D	20156686_c3_144	1358	4195	573	191	415	6.50E-39	Bacillus subtilis	P39157	ipc-33dUnknownB.subtilis spoII-R, glyC and upp genes.alternate gene name
Contig348D	20572255_f1_3	1359	4196	207	69					
Contig348D	21517182_f3_73	1360	4197	375	125	233	1.30E-19	Bacillus subtilis	e1185384	yozaA transcriptional regulator (ArsR family) homolog yozABacillus subtilis complete genome (section 11 of 21) similar to transcriptional regulator (ArsR family)
Contig348D	21756937_c1_100	1361	4198	672	224	401	2.00E-37	Bacillus subtilis	P39594	ipa-26thiamine-phosphate pyrophosphorylaseB.subtilis genomic region (325 to 333).thiE protein.alternate gene name
Contig348D	22460882_c3_135	1362	4199	687	229	612	8.70E-60	Bacillus subtilis	e1191863	dradeoxyribose-phosphate aldolaseB.subtilis operon contg. dra, nupC and pdp genes.
Contig348D	23439002_c2_111	1363	4200	1404	468					
Contig348D	23446887_f3_74	1364	4201	1155	385					
Contig348D	23594057_c1_87	1365	4202	183	61					
Contig348D	23595137_c3_134	1366	4203	501	167	423	9.20E-40	Bacillus subtilis	g2293159	ytkB stress- and starvation-induced gene controlled by sigma-B dpsBacillus subtilis rrnB-dnaB genomic region.similarity to H11349 from H. influenzae
Contig348D	23625008_c1_80	1367	4204	963	321	747	4.30E-74	Bacillus subtilis	e1182566	ydhSmannose-6-phosphate isomerase homolog ydhSBacillus subtilis complete genome (section 4 of 21) similar to mannose-6-phosphate isomerase
Contig348D	23634678_c2_116	1368	4205	1194	398					
Contig348D	23634702_c2_128	1369	4206	792	264	498	1.00E-47	Bacillus subtilis	P39593	ipa-25dihydroxyethylthiazole kinaseB.subtilis genomic region (325 to 333).hypothetical protein H10415.alternate gene name
Contig348D	23651702_c1_78	1370	4207	870	290	255	5.90E-22	Bacillus subtilis	e1184491	ywtE conserved hypothetical protein ywtEBacillus subtilis complete genome (section 19 of 21) similar to hypothetical proteins
Contig348D	2379658_f2_51	1371	4208	225	75					

Contig348D	2383253_c2_103	1372	4209	399	133	119	1.50E-07	thermophilic bacterium PS3	P09354	H <sup>+</sup> -transporting ATP synthase, chain I Thermophilic bacterium PS3 TF0F-1 operon for ATP synthase complex.I protein (AA 1 - 127)
Contig348D	24015687_c2_124	1373	4210	465	155					
Contig348D	24074137_c3_139	1374	4211	1332	444	1360	4.70E-139	Bacillus subtilis	g143434	rhoRho FactorBacillus subtilis OrfR, 3' end; OrfQ; transcriptional terminator(rho) gene; ribosomal protein L31; thymidine kinase (tdk) gene,complete cds.
Contig348D	24228411_c1_97	1375	4212	399	133	358	7.10E-33	Staphylococcus carnosus	g2735512	ssbsingle-strand binding protein homologStaphylococcus carnosus (3R)-hydroxymyristoyl acyl carrier proteindehydrase homolog (fabZ) gene, partial cds, YwpF homolog, single-strand binding protein homolog (ssb), SeeD precursor (seeD), SeeA precursor (seeA) and
Contig348D	24245327_c1_88	1376	4213	714	238	843	2.90E-84	Bacillus caldolyticus	e258331	uppuracil phosphoribosyltransferaseB.caldolyticus upp gene.
Contig348D	24254202_c1_91	1377	4214	1512	504	2050	3.60E-212	Bacillus megaterium	P17674	ATPAATP synthase alpha subunitB.megaterium ATP synthase i,a,c,b,delta,alpha,gamma,beta andepsilon subunit genes, complete cds, and ORF.H <sup>+</sup> -transporting ATP synthase alpha chain
Contig348D	24333427_c3_148	1378	4215	543	181	229	3.30E-19	Bacillus subtilis	P37811	atpHATP synthase subunit deltaB.subtilis (168) apase genes for ATP synthase subunits i, a, c, b, delta, alpha, gamma, beta, epsilon.
Contig348D	24392193_c1_79	1379	4216	204	68					
Contig348D	24406260_c2_120	1380	4217	1296	432	1258	3.00E-128	Bacillus subtilis	P19670	murZUDP-N-acetylglucosamineB.subtilis chromosomal DNA (region 320-321 degrees).alternate gene name
Contig348D	24415933_c2_112	1381	4218	435	145					

Contig348D	24508563_c2_122	1382	4219	1092	364	1226	7.50E-125	Bacillus subtilis	P45872	prfA peptide chain release factor 1B.subtilis chromosomal DNA (region 320-321 degrees).translation releasing factor start codon
Contig348D	24641687_c2_123	1383	4220	426	142	237	4.70E-20	Bacillus subtilis	P39155	ipc-31dUnknownB.subtilis spoII-R, glyC and upp genes.protein-tyrosine-phosphatase, low molecular weight alternate gene name
Contig348D	24647558_c1_82	1384	4221	357	119					
Contig348D	24665932_c3_142	1385	4222	840	280	477	1.70E-45	Bacillus subtilis	P45873	ywkEprotoporphyrinogen oxidase homolog ywkEB.subtilis chromosomal DNA (region 320-321 degrees).product similar to E.coli PREA2 protein
Contig348D	2541301_c3_149	1386	4223	351	117	180	5.20E-14	Bacillus subtilis	e1184584	ywzBhypothetical protein ywzBBacillus subtilis complete genome (section 19 of 21)
Contig348D	25422081_c3_132	1387	4224	204	68					
Contig348D	26751542_fl_10	1388	4225	492	164	577	4.40E-56	Helicobacter pylori	g2313188	HP0105conserved hypothetical proteinHelicobacter pylori section 10 of 134 of the complete genome.similar to EGAD
Contig348D	26757677_c2_106	1389	4226	1377	459	2163	3.80E-224	Staphylococcus aureus	e283110	femDS.aureus femD gene.
Contig348D	29695252_c3_143	1390	4227	1098	366	665	2.10E-65	Bacillus subtilis	P39153	ipc-29dSimilar to Saccharomyces cerevisiae SUA5B.subtilis spoII-R, glyC and upp genes.alternate gene name
Contig348D	29879407_c2_108	1391	4228	189	63					
Contig348D	30682816_c1_90	1392	4229	537	179	376	8.80E-35	Bacillus megaterium	P20601	ATPFATP synthase b subunitB.megaterium ATP synthase i,a,c,b,delta,alpha,gamma,beta andepsilon subunit genes, complete cds, and ORF.H+-transporting ATP synthase chain I
Contig348D	31637_c2_104	1393	4230	891	297	736	6.30E-73	Bacillus subtilis	d1020268	ybbPYbbPBacillus subtilis DNA for FeuB, FeuA, YbbB, YbbC, YbbD, YbzA, YbbE, YbbF, YbbH, YbbI, YbbJ, YbbK, YbbL, YbbM, YbbP, complete cds.alternate gene name



Contig348D	33412800_c2_118	1394	4231	882	294	135	1.00E-08	Bacillus subtilis	d1013033	b1D8tD Bacillus subtilis DNA, 283 Kb region containing skin element.alternate gene name
Contig348D	3361326_c2_101	1395	4232	207	69					
Contig348D	33673776_c2_121	1396	4233	297	99	296	2.60E-26	Bacillus subtilis	g2293155	ytiAYtiABacillus subtilis rmB-dnaB genomic region.homology with the ribosomal protein L31
Contig348D	33751260_c1_95	1397	4234	471	157	448	2.10E-42	Bacillus subtilis	e1184543	ywpBhydroxymyristoyl-(acyl carrier protein) de homolog ywpBBacillus subtilis complete genome (section 19 of 21)similar to hydroxymyristoyl-(acyl carrier protein)
Contig348D	34187702_c2_105	1398	4235	936	312	328	1.20E-29	Bacillus subtilis	e1182109	ybbRhypothetical protein ybbRBacillus subtilis complete genome (section 1 of 21)
Contig348D	34589010_c1_81	1399	4236	246	82					
Contig348D	34611067_f3_67	1400	4237	540	180	145	2.70E-10	Bacillus subtilis	P06629	yvjGhypothetical protein yvjGB.subtilis chromosomal DNA (region 320-321 degrees).
Contig348D	34615700_f2_41	1401	4238	819	273	155	2.30E-08	Caenorhabditis elegans	g1293846	C42D8.3Caenorhabditis elegans cosmid C42D8.coded for by C. elegans cDNA yk30b3.5; coded for by
Contig348D	34646926_f2_44	1402	4239	732	244	585	6.30E-57	Actinobacillus pleuropneumoniae	g1732037	dsoDpurine nucleoside phosphorylaseActinobacillus pleuropneumoniae heat-shock 10 protein GroES (mopB),heat-shock 60 protein GroEL (mopA), purine nucleoside phosphorylase(deoD) genes, complete cds, alcohol dehydrogenase (adhE) gene,partial cds.
Contig348D	35354656_f1_21	1403	4240	228	76					
Contig348D	35647783_f1_19	1404	4241	690	230	181	4.10E-14	Pyrococcus horikoshii	d1028033	PHLB002128aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 827700-833735 nt position(complementary strand), clone
Contig348D	36128785_c1_92	1405	4242	888	296	796	2.70E-79	Bacillus megaterium	P20602	ATPGATP synthase gamma subunitB.megaterium ATP synthase i,a,c,b,delta,alpha,gamma,beta andepsilon subunit genes, complete cds, and ORF.H+-transporting ATP synthase gamma chain

Contig348D	36225052_c3_147	1406	4243	234	78	270	1.50E-23	Bacillus firmus	g142570	atpEATP synthase c subunitBacillus firmus ATP synthase a and c subunit genes, 3' end and complete cds.H+-transporting ATP synthase lipid-binding proteinputative
Contig348D	4063202_c3_145	1407	4244	1239	413	1563	1.50E-160	Bacillus subtilis	P39148	glyCserine hydroxymethyltransferaseB.subtilis spoII-R, glyC and upp genes.glycine hydroxymethyltransferasealternate gene name
Contig348D	40712_f2_45	1408	4245	216	72					
Contig348D	4072135_c3_138	1409	4246	1467	489	870	4.00E-87	Mycobacterium tuberculosis	e304956	MTCY08D5.18aldehyde dehydrogenaseMycobacterium tuberculosis cosmid SCY08D5.MTCY08D5.18, aldehyde dehydrogenase, len
Contig348D	4178218_c1_83	1410	4247	675	225					
Contig348D	4728558_c2_107	1411	4248	1860	620	2088	3.40E-216	Bacillus subtilis	g726480	gcaAL-glutamine-D-fructose-6-phosphateBacillus subtilis L-glutamine-D-fructose-6-phosphateamidotransferase (gcaA) gene, complete cds.alternate gene name
Contig348D	476567_c1_84	1412	4249	567	189	292	7.00E-26	Bacillus subtilis	P12464	rpoERNA polymerase delta subunitB.subtilis RNA polymerase delta subunit (rpoE) gene, complete cds.DNA-directed RNA polymerase delta chainrpoE protein (tgg start codon)
Contig348D	4901712_c1_93	1413	4250	1428	476	1999	9.10E-207	Bacillus subtilis	P37809	atpDATP synthase subunit betaB.subtilis (168) atpase genes for ATP synthase subunits i, a, c, b, delta, alpha, gamma, beta, epsilon.H+-transporting ATP synthase alpha chain
Contig348D	4962802_c2_113	1414	4251	1305	435	1545	1.20E-158	Bacillus subtilis	P39142	pdpPyrimidine nucleoside phosphorylaseB.subtilis operon contg. dra, nupC and pdp genes.
Contig348D	5078177_c1_89	1415	4252	1062	354	1169	8.20E-119	Staphylococcus aureus	g1773355	cap5PCap5PStaphylococcus aureus capsule gene cluster Cap5A through Cap5Pgenes, complete cds.putative N-acetylglucosamine 2-epimerase
Contig348D	5131927_f1_17	1416	4253	210	70					

Contig348D	5319213_c2_127	1417	4254	417	139	312	5.30E-28	Bacillus subtilis	P37812	atpCATP synthase subunit epsilonB.subtilis (168) atpase genes for ATP synthase subunits i, a, c, b, delta, alpha, gamma, beta, epsilon.H+-transporting ATP synthase epsilon chain
Contig348D	5895301_c1_99	1418	4255	948	316	603	7.80E-59	Haemophilus influenzae	P44697	H10416hypotheticalHaemophilus influenzae from bases 436488 to 446714 (section 40 of 163) of the complete genome.similar to GB
Contig348D	6454635_c2_119	1419	4256	912	304	1173	3.10E-119	Bacillus subtilis	P13243	orfY-tsfructose-bisphosphate aldolaseBacillus subtilis spo0F, CTP synthetase (ctrA), andfructose-bisphosphate aldolase (orfY-ts) genes, complete cds.fructose-bisphosphate aldolase IIalternate gene name
Contig348D	6906576_c1_94	1420	4257	1296	432	1429	2.30E-146	Bacillus subtilis	e276830	murAUDP-N-acetylglucosamineB.subtilis atpC gene.
Contig348D	992291_f2_46	1421	4258	186	62					
Contig349D	1281557_c2_26	1422	4259	1131	377	899	3.30E-90	Bacillus subtilis	P96612	ddIAPROBABLE D-ALANINE--D-ALANINE LIGASE ABacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.
Contig349D	14855051_c3_42	1423	4260	471	157	409	2.80E-38	Bacillus subtilis	d1020070	ydcKconserved hypothetical protein ydcKBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.FUNCTION UNKNOWN.
Contig349D	19728433_f3_16	1424	4261	1215	405	691	3.70E-68	Bacillus subtilis	P39604	ipa-42cell-division protein homolog ywcFB.subtilis genomic region (325 to 333).alternate gene name
Contig349D	20348453_c2_27	1425	4262	1587	529	1214	1.40E-123	Bacillus subtilis	d1020048	ydbRATP-dependent RNA helicase homolog ydbRBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.ATP-DEPENDENT RNA HELICASE DEAD HOMOLOG.
Contig349D	20569052_c1_19	1426	4263	327	109	198	6.40E-16	Bacillus subtilis	e1186040	yvgZconserved hypothetical protein yvgZBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins

Contig349D	2230303_f1_8	1427	4264	669	223	346	1.30E-31	Bacillus subtilis	P54168	ypgQ conserved hypothetical protein ypgQBacillus subtilis (YAC10-9 clone) DNA region between the serA and kgd loci putative
Contig349D	22692137_c1_24	1428	4265	486	162	688	7.60E-68	Staphylococcus aureus	e279934	rsbWS.aureus sigB gene.
Contig349D	23437803_c2_32	1429	4266	2187	729	1827	1.50E-188	Staphylococcus aureus	e279936	ORF6S.aureus sigB gene.
Contig349D	23625387_c3_43	1430	4267	219	73					
Contig349D	23711642_c3_40	1431	4268	1026	342	1445	4.60E-148	Staphylococcus aureus	e284997	rsbUS.aureus rsbU, rsbV, rsbW & sigB genes.
Contig349D	24235952_c3_41	1432	4269	327	109	501	5.00E-48	Staphylococcus aureus	e284998	rsbVS.aureus rsbU, rsbV, rsbW & sigB genes.
Contig349D	24625216_f1_7	1433	4270	186	62					
Contig349D	24642963_c1_20	1434	4271	216	72					
Contig349D	26173800_c3_37	1435	4272	186	62					
Contig349D	26212756_f3_17	1436	4273	1488	496	1477	1.90E-151	Bacillus subtilis	e1184565	ywnEUnknownBacillus subtilis complete genome (section 19 of 21) similar to cardiolipin synthase
Contig349D	26360260_c2_29	1437	4274	375	125	285	3.90E-25	Bacillus subtilis	d1020052	ydcBholo- acyl-carrier protein synthase homolog ydcBBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN, SIMILAR PRODUCT IN E. COLI AND
Contig349D	2775462_c3_38	1438	4275	522	174	171	4.70E-13	Bacillus subtilis	d1020049	ydbShypothetical protein ydbSBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN.
Contig349D	30587843_f3_14	1439	4276	276	92					
Contig349D	33870312_c2_31	1440	4277	792	264	1213	1.80E-123	Staphylococcus aureus	e279935	sigBsigma factor BS.aureus sigB gene.
Contig349D	34062928_c2_30	1441	4278	1083	361	659	9.10E-65	BACILLUS STEAROTHERMOPHILUS	P10724	DALALANINE RACEMASE,
Contig349D	34181277_c1_22	1442	4279	501	167	153	3.80E-11	Bacillus subtilis	d1020049	ydbShypothetical protein ydbSBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN.

Contig349D	34250327_c3_39	1443	4280	363	121	540	3.70E-52	Staphylococcus aureus	e279931	ORF1S.aureus sigB gene.
Contig349D	35196926_c1_18	1444	4281	837	279	417	4.00E-39	Bacillus subtilis	P54544	yqjYqjGBacillus subtilis DNA, 283 Kb region containing skin element.similar to lipoprotein SpoIIJ-like
Contig349D	4869213_c2_28	1445	4282	1521	507	384	1.30E-35	Bacillus subtilis	d1020050	ydbYhypothetical protein ydbYBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.FUNCTION UNKNOWN.
Contig349D	582760_c1_23	1446	4283	207	69	108	2.20E-06	Staphylococcus aureus	e284995	S.aureus rsbU, rsbV, rsbW & sigB genes. ORF56
Contig349D	7240675_c1_21	1447	4284	1374	458	976	2.30E-98	Bacillus subtilis	d1020047	ydbQUDP-N-acetylmutamoylalanine-D-glutamyl-2,6-Bacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.PROBABLE UDP-N-ACETYL-MURAMOYLALANINE-D-GLUTAMYL-2,
Contig350D	1046885_f1_7	1448	4285	2217	739	1356	1.30E-138	Acinetobacter calcoaceticus	e245927	ppkpolyphosphate kinaseA.calcoaceticus ADPI, cysD, cobQ, sodM, syk, rubA, rubB, estB, ORF1, ppk, mtgA, ORF2 and ORF3 genes.putative; transcription of ppk is induced by
Contig350D	10585432_c1_371	1449	4286	591	197	171	1.90E-18	Bacillus subtilis	P54422	egggamma-glutamyltranspeptidaseBacillus subtilis gamma-glutamyltranspeptidase (ggg) gene, completecds.alternate gene name
Contig350D	10601625_c3_502	1450	4287	231	77					
Contig350D	1063552_f3_217	1451	4288	390	130					
Contig350D	1074177_c2_464	1452	4289	825	275	417	4.00E-39	Escherichia coli	g1787043	hypothetical protein b08222Escherichia coli K-12 MG1655 section 74 of 400 of the completegenome.f271; This 271 aa ORF is 24 pct identical (16 gaps)
Contig350D	10756925_f1_54	1453	4290	1566	522	793	5.70E-79	Bacillus subtilis	d1020925	YfmABacillus subtilis genomic DNA 69-70 degree region, partialsequence.
Contig350D	10954127_f3_230	1454	4291	201	67					

[illegible]

Contig350D	1298202_f2_204	1466	4303	1986	662	1779	1.90E-183	Bacillus subtilis	e1183221	yjdDfructose phosphotransferase system enzyme homolog yjdDBacillus subtilis complete genome (section 7 of 21)similar to fructose phosphotransferase system
Contig350D	13089086_c1_337	1467	4304	1035	345	120	2.50E-05	Bacillus firmus	g1813493	hydrophobic proteinBacillus firmus putative hydrophobic protein gene, partial cds.similar to Bacillus subtilis putative protein
Contig350D	1351687_c1_360	1468	4305	906	302	739	3.00E-73	Staphylococcus aureus	g1644433	ddhD-specific D-2-hydroxyacid dehydrogenaseStaphylococcus aureus D-specific D-2-hydroxyacid dehydrogenase(ddh) gene, complete cds.36.7 kDa protein; similar to NAD+-linked D-LDH,
Contig350D	1359635_f3_303	1469	4306	471	157	297	2.10E-26	Bacillus subtilis	e1181514	ykiAYkiABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.homologous to OsmC from Escherichia coli
Contig350D	1366012_f1_96	1470	4307	213	71					
Contig350D	1376926_c3_490	1471	4308	849	283	438	2.40E-41	Pseudomonas stutzeri	g3127079	ptxCPTxCPseudomonas stutzeri Orf117 (orf117), Orf86 (orf86) genes, completecds; and ptxABCDE operon, partial sequence.putative inner membrane component of
Contig350D	13835462_c3_504	1472	4309	1449	483	1161	5.80E-118	Clostridium perfringens	e242289	arcDarginine ornithine antiporterC.perfringens strain 13 arcABDC, ahrC and colA genes.
Contig350D	13869827_f3_244	1473	4310	2385	795	2176	1.60E-225	Bacillus subtilis	e1186038	yvgXheavy metal-transporting ATPase homolog yvgXBacillus subtilis complete genome (section 18 of 21)similar to heavy metal-transporting ATPase
Contig350D	14460882_c3_531	1474	4311	210	70	264	6.50E-23	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completedcds.ORF1
Contig350D	14495712_c1_393	1475	4312	297	99	103	1.20E-05	Synechocystis sp.	d1019027	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 15/27, 1848242-1991549.ORF ID
Contig350D	14534387_f3_299	1476	4313	225	75					

Contig350D	14626432_c2_398	1477	4314	2421	807	1387	6.50E-142	Staphylococcus aureus	O06446	secA SecA Staphylococcus aureus NCTC 8325 SecA (secA) gene, complete cds.
Contig350D	14644037_c3_512	1478	4315	1575	525	401	2.40E-40	Escherichia coli	g1787094	hypothetical protein b0869 Escherichia coli K-12 MG1655 section 78 of 400 of the complete genome.f486; This 486 aa ORF is 21 pct identical (13 gaps)
Contig350D	14650312_c3_505	1479	4316	1170	390	281	1.00E-24	Bacillus subtilis	e1184494	ywtB capsular polyglutamate biosynthesis homolog ywtB Bacillus subtilis complete genome (section 19 of 21) similar to capsular polyglutamate biosynthesis
Contig350D	14720378_c3_499	1480	4317	726	242	292	7.00E-26	Aquifex aeolicus	g2983456	aq_928 putative protein Aquifex aeolicus section 46 of 109 of the complete genome.
Contig350D	14729702_c2_402	1481	4318	2031	677	266	2.20E-19	Mus musculus	e1288122	DSPP dentin sialophosphoprotein Mus musculus DSPP gene.
Contig350D	14742887_c2_418	1482	4319	606	202					
Contig350D	14742937_c1_336	1483	4320	1203	401					
Contig350D	14879667_c2_440	1484	4321	867	289	735	8.00E-73	Bacillus subtilis	P52998	panCantothenate synthetase Bacillus subtilis (clone YAC15-6B) ypiABF genes, qcrABC genes, ypiABCDEF GHI genes, birA gene, panBCD genes, dinG gene, ypmB gene, aspB gene, asnS gene, dnaD gene, nth gene and ypoC gene, complete cds's. 40.8% of identity to the Esch
Contig350D	14880051_f1_20	1485	4322	1971	657	2450	1.50E-254	Bacillus subtilis	d1011939	yydE fructose-1,6-bisphosphatase Bacillus subtilis 36kb sequence between gntZ and tmY genes encoding 34 ORFs.alternate gene name
Contig350D	14881250_f3_234	1486	4323	999	333	1407	4.90E-144	Staphylococcus aureus	g1644433	ddhD-specific D-2-hydroxyacid dehydrogenase Staphylococcus aureus D-specific D-2-hydroxyacid dehydrogenase (ddh) gene, complete cds. 36.7 kDa protein; similar to NAD+-linked D-LDH,



Contig350D	14881908_c1_353	1487	4324	213	71				Treponema pallidum	g1354775	pfoS/R/pfoS/R Treponema pallidum methyl-accepting chemotaxis protein (mcp-1) gene, complete cds, and potential regulatory molecule (pfoS/R) gene, partial cds, potential regulatory molecule; pfoS/R-like
Contig350D	14931501_c2_444	1488	4325	1062	354	608		2.30E-59			
Contig350D	14961631_f1_32 14979713_c1_391	1489 1490	4326 4327	198 483	66 161	251		1.60E-21	Listeria monocytogenes	P33385	ORFZListeria monocytogenes lecithinase, lactate dehydrogenase (actA) gene complete cds, (plcB) gene complete cds, (ldh) gene completecds. ORFZ
Contig350D	158411_c3_534	1491	4328	993	331	880		3.40E-88	Bacillus subtilis	A25805	L-lactate dehydrogenase, L-lactate dehydrogenase
Contig350D	15914762_f1_63	1492	4329	579	193	534		1.60E-51	Bacillus subtilis	g1524394	yuaCconserved hypothetical protein yuaCBacillus subtilis gbsAB operon, glycine betaine aldehydedehydrogenase GbsA, alcohol dehydrogenase GbsB genes, complete cds. ORF-2 upstream of gbsAB operon
Contig350D	16798125_c2_473	1493	4330	441	147	154		2.20E-10	Bacillus subtilis	P42237	ycbEglucarate hydrataseBacillus subtilis DNA around 20 degrees region of chromosomecontaining yckA-T genes.similar to glucarate transporter
Contig350D	16838207_f1_22	1494	4331	288	96	175		1.80E-13	Escherichia coli	P39274	yjdIhypothetical 10.5 kD protein in decubylsuEscherichia coli K-12 MG1655 section 375 of 400 of the completegenome.o90a; 100 pct identical amino acid sequence and
Contig350D	17010952_c3_550	1495	4332	864	288	639		1.20E-62	Bacillus subtilis	e1186383	ykkDconserved hypothetical protein ykkDBacillus subtilis complete genome (section 20 of 21)similar to hypothetical proteins

Contig350D	179010_c3_547	1496	4333	546	182	344	2.20E-31	Haemophilus influenzae	P44687	HI0402methylated-DNA--protein-cysteineHaemophilus influenzae from bases 413366 to 426435 (section 38 of163) of the complete genome.methylated-DNA--protein-cysteine S-methyltransferase homologysimilar to SP
Contig350D	19531436_c3_516	1497	4334	357	119	96	7.30E-05	Methanococcus jannaschii	Q57859	MJ0416M. jannaschii predicted coding region MJ0416Methanococcus jannaschii section 35 of 150 of the complete genome.hypothetical protein; identified by GeneMark;
Contig350D	19562805_c3_546	1498	4335	213	71					
Contig350D	19564702_c1_339	1499	4336	477	159	397	5.30E-37	Nicotiana sylvestris	P30708	glutathione peroxidase homologN.sylvestris mRNA for 6P229 polypeptide homologous to animalglutathione peroxidases.glutathione peroxidasehomologous to animal glutathione peroxidases
Contig350D	19585877_c1_349	1500	4337	1212	404	834	2.60E-83	Bacillus subtilis	e1183009	yhaAminoacylase homolog yhaABacillus subtilis complete genome (section 6 of 21)similar to aminoacylase
Contig350D	19720642_c2_407	1501	4338	1296	432	253	3.40E-21	Bacillus subtilis	g2529465	yokPYokPBacillus subtilis 168 region at 182 min containing the cge genecluster.similar to the succinyl-diaminopimelate
Contig350D	197312_c2_447	1502	4339	873	291	813	4.30E-81	Bacillus subtilis	e1182946	yhdFhypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to glucose 1-dehydrogenase
Contig350D	19929586_c3_560	1503	4340	198	66					
Contig350D	20317_c2_413	1504	4341	2088	696	431	7.00E-38	Bacillus subtilis	P13485	tagFCDP-glycerolBacillus subtilis rodC operon.rodC (tag3) polypeptide (AA 1-746)

Contig350D	20335260_c1_344	1505	4342	1881	627	1711	3.00E-176	Escherichia coli	g1790686	nrdDanaerobic ribonucleoside-triphosphate reductaseEscherichia coli K-12 MG1655 section 385 of 400 of the complete genome.oxygen-sensitive ribonucleoside-triphosphate reductasef712; 99 pct identical amino acid sequence and
Contig350D	20360885_f3_226	1506	4343	1683	561	906	6.10E-91	Bacillus subtilis	e1182920	yhxBhypothetical proteinBacillus subtilis complete genome (section 5 of 21)similar to phosphomannomutase
Contig350D	20433135_c3_549	1507	4344	801	267	151	1.10E-10	Enterococcus faecalis	d1011987	orf8ORF8Enterococcus faecalis plasmid pY117 genes for BacA, BacB, ORF3,ORF4, ORF5, ORF6, ORF7, ORF8, ORF9, ORF10, ORF11,partial cds.
Contig350D	20507625_c3_487	1508	4345	1011	337	244	8.60E-21	Pseudomonas stutzeri	g3127078	ptxBPtxBPseudomonas stutzeri Orf117 (orf117), Orf86 (orf86) genes, completecds; and ptxABCDE operon, partial sequence.putative binding protein component of
Contig350D	20509637_c3_538	1509	4346	1335	445	218	6.70E-15	Bacillus subtilis	e1186076	yvbJhypothetical protein yvbJBacillus subtilis complete genome (section 18 of 21)
Contig350D	20509637_c3_564	1510	4347	1545	515	1655	2.60E-170	Bacillus licheniformis	P46834	gntKgluconate kinaseBacillus licheniformis DNA for hypothetical protein and Gntproteins.xylulokinase
Contig350D	20589568_c1_317	1511	4348	1557	519	282	9.50E-22	Bacillus subtilis	P13484	tagEUDP-glucoseBacillus subtilis rodC operon.rodD (gtaA) polypeptide (AA 1-673)
Contig350D	2068937_f3_282	1512	4349	1539	513	1041	3.00E-105	Bacillus subtilis	e1182553	phoBalkaline phosphatase IIIBacillus subtilis complete genome (section 4 of 21)alternate gene name
Contig350D	20822287_c1_386	1513	4350	684	228	563	1.30E-54	Bacillus subtilis	P10585	gntRgluconate operon repressorBacillus subtilis genomic DNA, 36 kb region between gnt and ioloperons.PROSITE; PS00043; HTH_GNTR_FAMILY; see SWISS_PROT
Contig350D	210885_f2_169	1514	4351	222	74					
Contig350D	2113952_f2_214	1515	4352	2835	945	183	1.50E-11	Vigna unguiculata	S54157	extensin-like protein

Contig350D	2136712_c3_574	1516	4353	1197	399	469	1.20E-44	Bacillus subtilis	e1182559	ydhlChloramphenicol resistance protein homolog ydhL.Bacillus subtilis complete genome (section 4 of 21) similar to chloramphenicol resistance protein
Contig350D	21515707_f3_242	1517	4354	198	66					
Contig350D	21517012_c2_412	1518	4355	411	137	289	1.50E-25	Bacillus subtilis	g2318065	yeeYeeBacillus subtilis strain 168 trpC2 YefA (yefA) gene, partial cds, and YefB (yefB), YefC (yefC), YeeA (yeeA), YeeB (yeeB), YeeC (yeeC), YeeD (yeeD), YeeE (yeeE) and YeeF (yeeF) genes, complete cds.
Contig350D	21604040_c1_361	1519	4356	2028	676	1295	3.60E-132	Methanococcus jannaschii	Q57986	MJ0566ferrous iron transport protein B (feoB)Methanococcus jannaschii section 47 of 150 of the complete genome.similar to SP
Contig350D	21664126_c2_409	1520	4357	1083	361	1134	4.20E-115	Lactobacillus sake	e1227705	arcBOrnithine transcarbamoylaseLactobacillus sake DNA encoding the arginine-deiminase pathway genes.
Contig350D	21687963_c1_328	1521	4358	477	159	184	2.00E-14	Bacillus subtilis	P17893	ahrCAhrCB subtilis ahrC gene, encoding an arginine repressor/activator protein. ahrC protein
Contig350D	21759718_f1_41	1522	4359	297	99					
Contig350D	21774087_c3_539	1523	4360	732	244	336	1.50E-30	Haemophilus influenzae	P44068	HI0882H. influenzae predicted coding region HI0882Haemophilus influenzae from bases 932179 to 942337 (section 85 of 163) of the complete genome.identified by GeneMark; putative
Contig350D	22380343_f2_206	1524	4361	1983	661	363	1.90E-30	Enterococcus faecalis	P37710	bacterial cell wall hydrolaseStreptococcus faecalis bacterial cell wall hydrolase gene, complete cds.
Contig350D	2242136_c3_506	1525	4362	684	228	583	1.00E-56	Clostridium perfringens	e303881	putative transposaseC.perfringens uapC, cpe, and nadC genes.

Contig350D	22460302_c1_357	1526	4363	756	252	334	2.50E-30	Staphylococcus carnosus	g2735514	sceASceA precursorStaphylococcus carnosus (3R)-hydroxymyristoyl acyl carrier proteinhydrolase homolog (fabZ) gene, partial cds, YwpF homolog, single-strand binding protein homolog (ssb), SceD precursor (sceD), SceA precursor (sceA) and SceE precursor (sceE)
Contig350D	23438751_f2_120	1527	4364	228	76					
Contig350D	23468942_f1_5	1528	4365	1101	367	928	2.80E-93	Bacillus subtilis	e1184131	ysdChypothetical proteinBacillus subtilis complete genome (section 15 of 21)similar to endo-1,4-beta-glucanase
Contig350D	23476503_f3_297	1529	4366	189	63					
Contig350D	23476702_c1_354	1530	4367	882	294	595	5.50E-58	Bacillus subtilis	P39592	ipa-24dhypothetical proteinB.subtilis genomic region (325 to 333).alternate gene name
Contig350D	23479702_c3_509	1531	4368	273	91					
Contig350D	23480467_c1_375	1532	4369	912	304	862	2.80E-86	Bacillus subtilis	e1185177	ylpAputative YhaP proteinBacillus subtilis complete genome (section 9 of 21)similar to L-serine dehydratase
Contig350D	23556338_c1_384	1533	4370	303	101	170	6.00E-13	Bacillus subtilis	e1182354	ycnEconserved hypothetical protein ycnEBacillus subtilis complete genome (section 3 of 21)similar to hypothetical proteins
Contig350D	23593800_c1_352	1534	4371	942	314	141	7.00E-08	Bacillus subtilis	d1020110	ydeIhypothetical protein ydeIBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.FUNCTION UNKNOWN.
Contig350D	23600752_f1_50	1535	4372	240	80					
Contig350D	23602015_c2_485	1536	4373	687	229	374	1.40E-34	Escherichia coli	P77279	YBBLhypothetical protein b0490Escherichia coli K-12 MG1655 section 45 of 400 of the completegenome.malK protein homologyo225; This 225 aa ORF is 32 pct identical (7 gaps)
Contig350D	23604052_f1_47	1537	4374	318	106					
Contig350D	23631311_c2_454	1538	4375	297	99					

Contig350D	23636343_c1_314	1539	4376	813	271	409	2.80E-38	Escherichia coli	P16683	PHNEphnE proteinE.coli psiD locus containing alkylphosphonate uptake (phn) genes A through Q, complete cds.phnE proteinphnE protein
Contig350D	23642942_c3_525	1540	4377	231	77					
Contig350D	23649187_c3_507	1541	4378	2637	879	209	1.30E-12	Plasmodium chabaudi	g1151158	repeat organellar proteinPlasmodium chabaudi repeat organellar protein gene, complete cds.ROPE
Contig350D	23672518_f3_232	1542	4379	1011	337	529	5.40E-51	Bacillus subtilis	e1185017	moeBmolybdopterin biosynthesis proteinBacillus subtilis complete genome (section 8 of 21)
Contig350D	23680300_f1_87	1543	4380	948	316					
Contig350D	23694162_f2_175	1544	4381	219	73					
Contig350D	23868887_c2_458	1545	4382	189	63					
Contig350D	24015687_c1_347	1546	4383	1521	507	1701	3.50E-175	Bacillus subtilis	P71016	gbsAGbsABacillus subtilis gbsAB operon, glycine betaine aldehydedehydrogenase GbsA, alcohol dehydrogenase GbsB genes, complete cds.glycine betaine aldehyde dehydrogenase
Contig350D	24022177_c1_387	1547	4384	1389	463	1499	8.80E-154	Bacillus subtilis	P12012	gntPgluconate permeaseBacillus subtilis genomic DNA, 36 kb region between gnt and ioloperons.homologs are found in E. coli and H. influenzae;
Contig350D	24087760_c3_519	1548	4385	903	301	665	2.10E-65	Bacillus subtilis	g2293257	ymMYtmBacillus subtilis rrmB-dnaB genomic region.similar to a hypothetical protein
Contig350D	24101701_c1_351	1549	4386	1542	514	1186	1.30E-120	Corynebacterium glutamicum	e1286985	mqlL-malate dehydrogenase (acceptor)Corynebacterium glutamicum DNA for L-Malate
Contig350D	24220260_c3_537	1550	4387	1056	352					
Contig350D	24220290_f2_132	1551	4388	1482	494	935	5.10E-94	Escherichia coli	d1015750	aldAAlddehyde dehydrogenase (NAD+) (EC 1.2.1.3)E.coli genomic DNA, Kohara clone #269(31.8-32.1 min.)ORF_ID

Contig350D	24226577_c3_563	1552	4389	834	278	153	7.90E-11	Bacillus sp.	P22853	merUnknown proteinBacillus sp. mercury resistance (merA) gene, complete cds. ORF1; putative
Contig350D	24261062_c2_421	1553	4390	1773	591	1994	3.10E-206	Bacillus subtilis	e1186031	yvgQsulfite reductase homolog yvgQBacillus subtilis complete genome (section 18 of 21) similar to sulfite reductase
Contig350D	24273375_c3_523	1554	4391	600	200	282	2.40E-24	Escherichia coli	g1788102	hypothetical protein b1801Escherichia coli K-12 MG1655 section 164 of 400 of the complete genome. o481; UUG start; 29 pct identical (3 gaps) to 447
Contig350D	24304712_f1_80	1555	4392	1674	558	1008	9.40E-102	Enterobacter cloacae	P23234	IPDCindolepyruvate decarboxylase, E. cloacae gene for indolepyruvate decarboxylase. thiamine pyrophosphate-binding domain homology indolepyruvate decarboxylase
Contig350D	24337791_c3_515	1556	4393	1113	371					
Contig350D	24337807_c1_341	1557	4394	1890	630	1795	3.80E-185	Bacillus subtilis	e1186032	yvgRsulfite reductase homolog yvgRBacillus subtilis complete genome (section 18 of 21) similar to sulfite reductase
Contig350D	24338217_c3_521	1558	4395	597	199	259	2.20E-22	Haemophilus influenzae	P45080	H1115anaerobic ribonucleoside-triphosphate reductaseHaemophilus influenzae from bases 1218795 to 1228832 (section 110 of 163) of the complete genome similar to SP
Contig350D	24351562_f3_298	1559	4396	255	85					
Contig350D	24353390_c2_479	1560	4397	696	232	421	1.50E-39	Synechocystis sp.	d1011336	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 24/27, 3002966-3138603.ribitol dehydrogenaseORF_ID
Contig350D	24406952_c1_330	1561	4398	447	149	188	7.40E-15	Rhodobacter capsulatus	P31078	petProtein of unknown functionR. capsulatus petP, petR, and fbcF genes, part of the petPR operon in front of fbc operon
Contig350D	24407875_c3_524	1562	4399	753	251	350	5.00E-32	Escherichia coli	d1016320	Probable carnitine transporter.E.coli genomic DNA, Kohara clone #332(40.4-40.7 min.). ORF_ID





Contig350D	24648502_c3_526	1573	4410	468	156	228	4.30E-19	Bacillus subtilis	P38049	yhgCHypothetical proteinBacillus subtilis penicillin-binding protein (pbpF) gene, 5' end, product unknown
Contig350D	24665957_c3_551	1574	4411	1494	498	1335	2.10E-136	Bacillus subtilis	P39211	xyIBxylulose kinaseBacillus subtilis SpoVK (spoVK), YnbA (ynbA), YnbB (ynbB), GlnR(glnR), glutamine synthetase (glnA), YnaA (ynaA), YnaB (ynaB), YnaC(ynaC), YnaD (ynaD), YnaE (ynaE), YnaF (ynaF), YnaG (ynaG), YnaH(ynaH), YnaI (ynaI), YnaJ (ynaJ), xylan be
Contig350D	24722175_c1_370	1575	4412	1101	367	353	2.40E-32	Bacillus subtilis	e1184494	ywtBcapsular polyglutamate biosynthesis homolog ywtBBacillus subtilis complete genome (section 19 of 21)similar to capsular polyglutamate biosynthesis
Contig350D	24730438_c2_461	1576	4413	420	140	276	3.50E-24	Haemophilus influenzae	P44734	HI0501high affinity ribose transport protein (rbsD)Haemophilus influenzae from bases 515922 to 527487 (section 47 of 163) of the complete genome.similar to GB
Contig350D	24797140_c2_474	1577	4414	900	300	145	6.10E-08	PSEUDOMONAS FLUORESCENS	P22862	ARYLESTERASE, (ARYL-ESTER HYDROLASE)
Contig350D	24814838_c2_443	1578	4415	870	290	350	5.00E-32	Synechocystis sp.	d1019435	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 26/27, 3270710-3418851. ORF ID
Contig350D	24817202_c1_358	1579	4416	1809	603	799	1.90E-116	Bacillus subtilis	g1934616	yrhLhypothetical protein YrhLBacillus subtilis cysteine synthase (yrhA), cystathioninegamma-lyase (yrhB), YrhC (yrhC), YrhD (yrhD), formate dehydrogenasechain A (yrhE), YrhF (yrhF), formate dehydrogenase (yrhG), YrhH(yrhH), regulatory protein (yrhI), cyto
Contig350D	250178_c3_555	1580	4417	234	78					
Contig350D	2507950_f1_43	1581	4418	216	72					
Contig350D	25398426_f1_48	1582	4419	198	66					
Contig350D	25429700_c2_395	1583	4420	1356	452	130	1.80E-05	Schistosoma mansoni	g454844	Schistosoma mansoni p48 eggshell protein gene, complete cds. ORF 3

Contig350D	25578215_c3_518	1584	4421	543	181	483	4.00E-46	Staphylococcus sciuri	e316582	ORF141S.sciuri mecA gene, strain K11 (792).
Contig350D	2557962_f2_172	1585	4422	1377	459	953	6.30E-96	Enterococcus faecalis	P37061	noxNADH oxidaseS.faecalis nox gene for NADH oxidase.
Contig350D	25600015_c3_527	1586	4423	1632	544	1561	2.40E-160	Bacillus subtilis	g2293232	ytcIYtcIBacillus subtilis rrmB-dnaB genomic region.putative acetate CoA- ligase
Contig350D	25961087_f1_23	1587	4424	813	271	399	3.20E-37	Bacillus subtilis	P54721	yfiEunknownBacillus subtilis complete genome (section 5 of 21)similar to hypothetical proteins from B. subtilis
Contig350D	26179777_c1_379	1588	4425	1818	606	522	3.00E-50	Synechocystis sp.	d1011128	hypothetical proteinSynchocystis sp. PCC6803 complete genome, 22/27, 2755703-2868766. ORF_ID
Contig350D	26353411_c1_316	1589	4426	576	192					
Contig350D	26380265_c3_503	1590	4427	1263	421	1190	4.90E-121	Lactobacillus sake	e1227704	arcAArginine deiminaseLactobacillus sake DNA encoding the arginine-deiminase pathwaygenes.
Contig350D	26383512_c1_356	1591	4428	1398	466	1195	1.40E-121	Bacillus subtilis	d1020148	ydgFamino acid ABC transporter (permease) homolog ydgFBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.PROBABLE AMINO ACID TRANSPORT PERMIASE.
Contig350D	26571937_f2_128	1592	4429	789	263	838	9.70E-84	Bacillus subtilis	e1183189	yjbThiamin biosynthesis homolog yjbTBacillus subtilis complete genome (section 7 of 21)similar to thiamin biosynthesis
Contig350D	26595641_f2_129	1593	4430	621	207	416	5.10E-39	Lactococcus lactis	Q48630	aplalkaline phosphatase like proteinL.lactis (MG1363) apl gene for alkaline phosphatase like protein.
Contig350D	26605001_c3_571	1594	4431	825	275	686	1.20E-67	Bacillus subtilis	P46331	yxvGprobable oxidoreductaseBacillus subtilis genomic DNA, 36 kb region between gnt and ioloperons.conerved universally
Contig350D	26672512_c1_377	1595	4432	192	64					
Contig350D	273452_c2_452	1596	4433	1278	426	800	1.00E-79	Archaeoglobus fulgidus	g2648815	AF17363-hydroxy-3-methylglutaryl- coenzyme A reductaseArchaeoglobus fulgidus section 124 of 172 of the complete genome.similar to SP

Contig350D	2739050_c2_453	1597	4434	927	309	583	1.00E-56	Bacillus subtilis	P39592	ipa-24 hypothetical proteinB. subtilis genomic region (325 to 333). alternate gene name
Contig350D	2739561_f1_14	1598	4435	1440	480	1505	2.00E-154	Bacillus subtilis	P37948	glpT glycerol 3-phosphate permeaseB. subtilis glpT and glpQ genes for glycerol 3-phosphate permease and glycerophosphoryl diester phosphodiesterase. hexose phosphate transport protein uhpT alternate gene name
Contig350D	2760930_f1_21	1599	4436	189	63					
Contig350D	2790936_f2_205	1600	4437	954	318	834	2.60E-83	Streptococcus mutans	Q59935	pmiMannosephosphate isomeraseS. mutans pmi gene for mannosephosphate isomerase (complete cds) and scrK gene for fructokinase (partial cds).
Contig350D	2823562_c3_533	1601	4438	1365	455	909	2.90E-91	Pyrococcus horikoshii	d1028608	PHCC050438aa long hypothetical aminotransferasePyrococcus horikoshii OT3 genomic DNA, 1300517-1338254 nt position, clone contains aminotransferases class-III
Contig350D	2867961_c2_469	1602	4439	963	321	410	2.20E-38	Bacillus subtilis	d1023108	ycdHYcdHBacillus subtilis genomic DNA, 22 to 25 degree region, complete cds. homologue of adhesion protein precursor of
Contig350D	29352312_c3_514	1603	4440	765	255	617	2.60E-60	Bacillus subtilis	P42423	B65F hypothetical proteinBacillus subtilis 15 kb chromosome segment contains the iol operon. homologous to cell division protein FisE of E.
Contig350D	29400332_c1_385	1604	4441	417	139	309	1.10E-27	Bacillus subtilis	d1020028	ydaThy hypothetical protein ydaTBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. FUNCTION UNKNOWN.
Contig350D	29695327_c3_517	1605	4442	750	250					
Contig350D	30133562_c1_318	1606	4443	1191	397	306	2.30E-27	Bacillus subtilis	P37498	yybF unknownB. subtilis DNA, 180 kilobase region of replication origin. similar to antibiotic resistance protein

Contig350D	30470325_c3_561	1607	4444	1953	651	425	6.80E-38	Bacillus subtilis	e1186043	yvaC conserved hypothetical protein yvaCBacillus subtilis complete genome (section 18 of 21) similar to hypothetical proteins
Contig350D	30651577_c3_552	1608	4445	612	204					
Contig350D	31693_c2_410	1609	4446	699	233	128	6.00E-08	Streptococcus pyogenes	JH0364	hypothetical protein 176 (SAGP 5' region)
Contig350D	31720942_f2_200	1610	4447	576	192					
Contig350D	32221012_c1_383	1611	4448	471	157	114	7.60E-06	Homo sapiens	g2062692	NPT4 sodium phosphate transporter Human sodium phosphate transporter (NPT4) mRNA, complete cds.
Contig350D	32664093_f2_127	1612	4449	627	209	142	5.50E-10	Aquifex aeolicus	g2983767	thiE1 thiamine phosphate synthase Aquifex aeolicus section 68 of 109 of the complete genome.
Contig350D	33211092_f3_256	1613	4450	471	157					
Contig350D	33241093_c2_448	1614	4451	1557	519	1634	4.30E-168	Bacillus subtilis	e1182273	ygcN 68% identity protein to Bacillus subtilis complete genome (section 2 of 21) similar to 1-pyrroline-5-carboxylate dehydrogenase
Contig350D	33242842_c1_388	1615	4452	2871	957	315	1.70E-24	Saccharomyces cerevisiae	g914990	YDR332WY dr332wp Saccharomyces cerevisiae chromosome IV cosmid 9798. Similar to DEAD box family helicases
Contig350D	33359381_c2_401	1616	4453	210	70					
Contig350D	33391337_c2_484	1617	4454	864	288					
Contig350D	33620176_c3_528	1618	4455	858	286	494	2.80E-47	Staphylococcus aureus	d1020251	orf30 Staphylococcus aureus DNA for sigma70 operon, complete cds.
Contig350D	3402312_c1_365	1619	4456	1761	587	1316	2.20E-134	Bacillus subtilis	d1020024	ydaP pyruvate oxidase homolog ydaP Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. SIMILAR TO PYRUVATE OXIDASE AND ACETOLACTATE
Contig350D	34197318_f3_258	1620	4457	903	301	1117	2.70E-113	Staphylococcus carnosus	Q07159	fdafuctose-bisphosphate aldolase S. carnosus fda gene.

	Contig350D	34410843_c2_399	1621	4458	1431	477						
	Contig350D	34412952_c3_573	1622	4459	783	261	580	2.10E-56	Escherichia coli	P77307	YBBMhypothetical protein b0491 Escherichia coli K-12 MG1655 section 45 of 400 of the complete genome.o268; This 268 aa ORF is 27 pct identical (9 gaps)	
	Contig350D	34617937_f3_296	1623	4460	525	175	223	1.10E-17	Dictyostelium discoideum	g2952545	DBIocoronin binding protein Dictyostelium discoideum coronin binding protein (DBIO) mRNA,complete cds.	
	Contig350D	34647150_c1_331	1624	4461	1356	452	274	1.40E-23	Litomosoides sigmodontis	g2570198	shp3microfilarial sheath protein SHP3Litomosoides sigmodontis microfilarial sheath proteins SHP3a(shp3a) and SHP3 (shp3) genes, complete cds.structural protein; similar to shp3 genes from	
	Contig350D	35193950_c2_451	1625	4462	489	163						
	Contig350D	35317188_c2_396	1626	4463	6414	2138	1445	2.20E-149	Caenorhabditis elegans	gl707247	KO6A9.1Caenorhabditis elegans cosmid KO6A9 partial CDS; coded for by C. elegans cDNA yk50c7.5	
	Contig350D	35433438_f3_231	1627	4464	1137	379	420	1.90E-39	Bacillus subtilis	e1183187	yjBRsarcosine oxidase homolog yjbRBacillus subtilis complete genome (section 7 of 21)similar to sarcosine oxidase	
	Contig350D	35993802_c2_397	1628	4465	1584	528						
	Contig350D	36127302_c2_476	1629	4466	888	296	1058	4.70E-107	Bacillus subtilis	Q05852	gtABUDP-glucose pyrophosphorylaseBacillus subtilis UDP-glucose pyrophosphorylase (gtAB) gene,complete cds.Escherichia coli UTP--glucose-1-phosphate uridylyltransferasesimilar to UDP-glucose pyrophosphorylase of	
	Contig350D	36151692_c2_466	1630	4467	681	227	671	4.80E-66	Bacillus subtilis	e1182773	yfkOYfkOBacillus subtilis complete genome (section 5 of 21)similar to NAD(P)+flavin oxidoreductase	

Contig350D	36205285_c2_411	1631	4468	780	260	284	5.00E-25	Caldicellulosiruptor saccharolyticus	P23553	XynCacetylxylosidaseCaldicellulosiruptor saccharolyticus putative transport protein(XynG), putative transport protein (XynH), xylanase (XynF), xylanase (XynE), xylanase (XynD), xylanase (XynA), acetylxylosidase(XynC) and xylanase (XynB) genes, complete cds
Contig350D	36225250_c2_408	1632	4469	1542	514	2622	8.70E-273	Staphylococcus epidermidis	P43148	SepP1 proteaseS.epidermis gene for protease.
Contig350D	36617832_c2_422	1633	4470	801	267	758	2.90E-75	Bacillus megaterium	P29928	COBAS-adenosyl-L-methionineBacillus megaterium S-adenosyl-L-methionineATCC #1078
Contig350D	3909376_c2_394	1634	4471	396	132	244	8.60E-21	Helicobacter pylori	g2314761	HP1576ABC transporter, ATP-binding protein (abc)Helicobacter pylori section 133 of 134 of the complete genome.malK protein homologysimilar to EGAD
Contig350D	3910675_f3_293	1635	4472	234	78					
Contig350D	3923842_c2_460	1636	4473	891	297	442	8.90E-42	Bacillus megaterium	P40419	hypothetical 30.5K chainB. megaterium glucose dehydrogenase (EC 1.1.1.47) and ORFs.ORF2
Contig350D	3941078_f1_19	1637	4474	324	108	110	1.40E-06	Bacillus subtilis	e1183188	yjbShypothetical protein yjbSBacillus subtilis complete genome (section 7 of 21)
Contig350D	3945818_f3_216	1638	4475	1485	495	1215	1.10E-123	Bacillus subtilis	e1182164	ybeCamino acid transporter homolog ybeCBacillus subtilis complete genome (section 2 of 21)similar to amino acid transporter
Contig350D	3953400_f1_82	1639	4476	195	65					
Contig350D	4003431_f2_195	1640	4477	204	68					
Contig350D	4079552_f2_171	1641	4478	630	210					
Contig350D	4079626_f1_88	1642	4479	192	64					
Contig350D	4094703_c1_333	1643	4480	2022	674	224	3.10E-21	Bacillus subtilis	g2293178	ytsDYtsDBacillus subtilis rmB-dnaB genomic region.similarity to NADH dehydrogenase
Contig350D	40966_c3_495	1644	4481	1626	542					
Contig350D	4100938_c2_472	1645	4482	534	178	291	1.60E-25	Bacillus subtilis	P42237	ycbEglucarate dehydrataseBacillus subtilis DNA around 20 degrees region of chromosomecontaining yckA-T genes.similar to glucarate transporter

Contig350D	4148428_f1_33	1646	4483	1149	383	528	6.90E-51	Alcaligenes eutrophus	P14940	ADH alcohol dehydrogenase, A. eutrophus alcohol dehydrogenase (ADH) gene, complete cds. alcohol dehydrogenase alcohol dehydrogenase (EC 1.1.1.1)
Contig350D	4167842_f2_112	1647	4484	201	67					
Contig350D	4303377_f2_142	1648	4485	270	90					
Contig350D	4303927_c1_381	1649	4486	312	104					
Contig350D	4329453_c1_367	1650	4487	336	112	220	3.00E-18	Bacillus subtilis	d1020138	ydQ thioredoxin homolog ydQ Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. SIMILAR TO THIOREDOXIN.
Contig350D	4336088_c1_342	1651	4488	624	208	283	6.30E-25	Bacillus subtilis	e332189	yInFYInF protein Bacillus subtilis pyrE to yloA gene region. similar to uroporphyrin- III C-methyltransferase
Contig350D	4459375_f2_207	1652	4489	207	69					
Contig350D	4491713_f2_113	1653	4490	1542	514	416	5.10E-39	Helicobacter pylori	g2313368	HP0278 guanosine pentaphosphate phosphohydrolase Helicobacter pylori section 24 of 134 of the complete genome. similar to EGAD
Contig350D	4574012_f1_46	1654	4491	1080	360	600	1.60E-58	Drosophila melanogaster	JN0500	dhodihydroxylate oxidase,, mitochondrial hydroxylate oxidase
Contig350D	4662_f2_168	1655	4492	318	106					
Contig350D	4687752_c1_359	1656	4493	1185	395	773	7.50E-77	Bacillus subtilis	e1184948	ykrV aspartate aminotransferase homolog ykrV Bacillus subtilis complete genome (section 8 of 21) similar to aspartate aminotransferase
Contig350D	4713377_f2_144	1657	4494	447	149					
Contig350D	4719775_c3_562	1658	4495	744	248	434	6.30E-41	Bacillus subtilis	P39583	ipa-7dGTP-pyrophosphokinase homolog ywaCB. subtilis genomic region (325 to 333). alternate gene name
Contig350D	4723510_c2_430	1659	4496	2661	887	2374	1.70E-246	CLOSTRIDIUM SYMBIOSUM	P22983	PPDK DIKINASE)
Contig350D	4727187_c2_403	1660	4497	2889	963	617	6.20E-58	Lactococcus lactis	P49022	pipLactococcus lactis pip and gerC2 genes, complete cds's, and rrg gene, 5' end of cds. GTG start codon
Contig350D	4787807_f3_218	1661	4498	210	70					





Contig350D	5314077_c1_335	1673	4510	1593	531	1036	1.00E-104	Escherichia coli	P31448	yidK hypothetical 62.1 kD protein in ilvO <sub>1</sub> operon of <i>Escherichia coli</i> K-12 MG1655 section 335 of 400 of the complete genome.f571; 100 pct identical to YIDK_ECOLI SW
Contig350D	5369212_c3_567	1674	4511	1509	503	425	1.60E-39	Bacillus subtilis	P13484	tagEUDP-glucoseBacillus subtilis rodC operon.rodD (gtaA) polypeptide (AA 1-673)
Contig350D	56693_c1_324	1675	4512	792	264	778	2.20E-77	Bos taurus	g2058476	acetoin reductaseBos taurus acetoin reductase mRNA, complete cds.similar to acetoin reductase of Klebsiella
Contig350D	5915653_f2_197	1676	4513	183	61					
Contig350D	6047827_c2_438	1677	4514	705	235	569	3.10E-55	Lactococcus lactis	g2565161	aldBaldBLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisE (hisE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig350D	6070938_c1_348	1678	4515	1773	591	1342	3.80E-137	Escherichia coli	P17444	betAcholone dehydrogenaseEscherichia coli K-12 MG1655 section 28 of 400 of the complete genome.alcohol oxidasef556; 100 pct identical to BETA_ECOLI SW
Contig350D	6136050_c2_449	1679	4516	246	82					
Contig350D	6136527_c2_424	1680	4517	615	205	618	2.00E-60	Bacillus subtilis	e332186	ynlCputative adenosine 5-phosphosulfate kinaseBacillus subtilis pyrE to yloA gene region.similar to adenylylsulfate kinase
Contig350D	6369688_f2_125	1681	4518	915	305	119	2.90E-05	Methanococcus jannaschii	Q57819	MJ0374 lipoprotein B (lppB)Methanococcus jannaschii section 32 of 150 of the complete genome.similar to GB
Contig350D	6442202_f3_233	1682	4519	1050	350	310	8.70E-28	Bacillus subtilis	P37520	yvaDunknownB. subtilis DNA, 180 kilobase region of replication origin.unnamed protein product
Contig350D	6678507_f3_267	1683	4520	207	69					

Contig350D	6829812_c1_372	1684	4521	948	316	592	1.10E-57	Haemophilus influenzae	P44331	H10505ribokinase (rbsK)Haemophilus influenzae from bases 515922 to 527487 (section 47 of163) of the complete genome.ribokinasesimilar to GB
Contig350D	6837938_f1_103	1685	4522	3561	1187	198	1.80E-14	Homo sapiens	P51861	CDR1cerebellar degeneration-related proteinHuman cerebellar-degeneration-related antigen (CDR34) gene,complete cds.cerebellar-degeneration-related antigen (CDR34)
Contig350D	6844012_c3_522	1686	4523	1344	448	589	2.40E-57	Escherichia coli	P04539	dcuAnaerobic c4-dicarboxylate transporter dcuaEscherichia coli K-12 MG1655 section 376 of 400 of the completegenome.dicarboxylate membrane-transporter protein Af433; 100 pct identical amino acid sequence and
Contig350D	6928_c1_373	1687	4524	843	281					
Contig350D	7227175_c3_508	1688	4525	189	63					
Contig350D	7228517_c3_568	1689	4526	411	137	191	3.50E-15	Mycobacterium tuberculosis	e317133	mutTMutMycobacterium tuberculosis cosmid 165.MTCl65.27, mutT, len
Contig350D	7234627_c1_389	1690	4527	210	70					
Contig350D	7245377_c1_368	1691	4528	1002	334	258	2.80E-22	Acinetobacter lwoffii	g1209223	esteraseAcinetobacter lwoffii orf1 and esterase (est) genes, complete cds.
Contig350D	7301078_c3_488	1692	4529	465	155	340	5.80E-31	Pseudomonas stutzeri	g3114664	htxDA TPase component HtxDPseudomonas stutzeri putative alpha-ketoglutarate-dependent hypophosphite dioxygenase (htxA), binding protein component HtxB(htxB), inner membrane component HtxC (htxC), ATPase component HtxD(htxD), inner membrane component HtxE (h

Contig350D	787677_f2_152	1693	4530	483	161	246	5.30E-21	Staphylococcus carnosus	g2735506	sceBSceB precursorStaphylococcus carnosus N5,N10-methylenetetrahydromethanopterinreductase homolog, SceB precursor (sceB) and putative transmembrane protein genes, complete cds, and putative Na <sup>+</sup> /H <sup>+</sup> antiporter NhaC(nhaC) gene, partial cds.major secreted pro
Contig350D	823518_f1_35	1694	4531	225	75					
Contig350D	860425_c3_553	1695	4532	258	86	106	3.60E-06	Paramecium bursaria Chlorella virus 1	g624122	a56LParmecium bursaria Chlorella virus 1, complete genome.contains type 1 hydrophobic transmembrane region
Contig350D	86088_f2_211	1696	4533	369	123	154	3.00E-11	Staphylococcus carnosus	g2735504	Staphylococcus carnosus N5,N10-methylenetetrahydromethanopterinreductase homolog, SceB precursor (sceB) and putative transmembrane protein genes, complete cds, and putative Na <sup>+</sup> /H <sup>+</sup> antiporter NhaC(nhaC) gene, partial cds.Orf1
Contig350D	860917_f2_191	1697	4534	201	67					
Contig350D	895253_c3_497	1698	4535	510	170	302	6.10E-27	Helicobacter pylori	g2313314	HP0224peptide methionine sulfoxide reductase (msrA)Helicobacter pylori section 20 of 134 of the complete genome.similar to EGAD
Contig350D	901377_c2_441	1699	4536	327	109					
Contig350D	953142_f1_51	1700	4537	954	318	228	4.30E-19	Mycobacterium tuberculosis	Q50648	MTCY227.28cunknownMycobacterium tuberculosis cosmid Y227.MTCY227.28c, unknown, len
Contig350D	961562_c1_319	1701	4538	186	62					
Contig350D	968800_c2_446	1702	4539	804	268	1031	3.40E-104	Staphylococcus aureus	e244971	S.aureus orfs 1,2,3 & 4.ORF1
Contig350D	978965_c3_511	1703	4540	213	71					
Contig350D	9875333_c1_376	1704	4541	1533	511	1134	4.20E-115	Vibrio cholerae	P23240	aldAaldehyde dehydrogenaseVibrio cholerae pathogenicity island, putative transposase,aldehyde dehydrogenase (aldA), toxR-activated gene A protein(tagA), putative inner membrane protein, and putative zincmetalloprotease genes, complete cds; and toxR-activa

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Contig352D	134677_f2_45	1720	4557	1101	367	1373	2.00E-140	Bacillus subtilis	P37518	yyaF unknown B. subtilis DNA, 180 kilobase region of replication origin. similar to hypothetical proteins
Contig352D	14220027_f3_55	1721	4558	1143	381	190	2.50E-12	Enterococcus faecalis	d1025733	baeG Enterococcus faecalis plasmid pPD1 bacA, bacB, bacC, bacD, bacE, bacF, bacG, bacH and bacI genes, complete cds.
Contig352D	14547556_f1_29	1722	4559	453	151					
Contig352D	14728382_f1_21	1723	4560	300	100	336	1.50E-30	Bacillus subtilis	P21468	rpsF ribosomal protein S6B. subtilis DNA, 180 kilobase region of replication origin. Escherichia coli ribosomal protein S6
Contig352D	14881552_f1_14	1724	4561	216	72					
Contig352D	15052318_f2_30	1725	4562	1395	465	1606	4.00E-165	Bacillus subtilis	P25811	tdhF thiophen and furan oxidation B. subtilis DNA, 180 kilobase region of replication origin. homologous to E. coli 50K
Contig352D	15752213_f1_5	1726	4563	270	90					
Contig352D	16432963_c1_88	1727	4564	1116	372	972	6.10E-98	Bacillus subtilis	e1183207	ycjC cystathionine gamma-synthase homolog yjcI Bacillus subtilis complete genome (section 7 of 21) similar to cystathionine gamma-synthase
Contig352D	19548192_c3_136	1728	4565	765	255					
Contig352D	1960300_f1_11	1729	4566	201	67					
Contig352D	20517318_f1_17	1730	4567	1200	400	1171	5.00E-119	Thermoanaerobacterium thermosaccharolyticum	e281310	thlA acetyl coenzyme A acetyltransferase (thiolase) C. thermosaccharolyticum etfB, etfA, hbd, thlA and actA genes.
Contig352D	2148468_f2_34	1731	4568	2073	691	1498	1.10E-153	Staphylococcus aureus	P10335	GEH triacylglycerol lipase, S. aureus gene encoding lipase (glycerol ester hydrolase) lipase precursor (geh; EC 3.1.1.3)
Contig352D	21506575_c1_85	1732	4569	897	299	331	5.20E-30	Bacteriophage phi1e	e257764	Lysylsintactin Lactobacillus bacteriophage phi1e DNA for Rorf162, Holin, Lysin, and Rorf175 genes. gta start codon

Contig352D	23462762_c3_128	1733	4570	1527	509	2298	1.90E-238	Staphylococcus aureus	g1916317	ahpFalkyl hydroperoxide reductase subunit FStaphylococcus aureus alkyl hydroperoxide reductase subunit C(aphC) and subunit F (aphF) genes, complete cds.AhpF
Contig352D	23634786_f3_56	1734	4571	1200	400	692	2.90E-68	Enterococcus faecalis	d1025735	baclEnterococcus faecalis plasmid pPDI bacA, bacB, bacC, bacD, bacE, bacF, bacG, bacH and bacI genes, complete cds.
Contig352D	23860812_f2_37	1735	4572	603	201	534	1.60E-51	Staphylococcus aureus	g1595810	spsBtype-I signal peptidase SpsBStaphylococcus aureus type-I signal peptidase SpsA (spsA) gene, and type-I signal peptidase SpsB (spsB) gene, complete cds.signal peptidase, leader peptidase, serine
Contig352D	24220062_c3_129	1736	4573	285	95					
Contig352D	24406338_c3_138	1737	4574	186	62					
Contig352D	24431502_c3_137	1738	4575	846	282	297	2.10E-26	Archaeoglobus fulgidus	g2649574	AF1021ABC transporter, ATP-binding proteinArchaeoglobus fulgidus section 74 of 172 of the complete genome.similar to GB
Contig352D	24647142_c2_116	1739	4576	645	215	575	7.20E-56	Staphylococcus xylosum	c352094	orf5hypothetical proteinStaphylococcus xylosum lacR, lacP, lacH genes and 2 ORF's.
Contig352D	24665811_c3_127	1740	4577	486	162	166	1.60E-12	Anolis pulchellus	g1197667	vitellogeninAnolis pulchellus vitellogenin mRNA, partial cds.ApVtg5; similar to chicken and Xenopus phosvitin
Contig352D	25548452_f1_20	1741	4578	915	305	354	1.90E-32	Bacillus subtilis	e1181925	ykuTYkuT proteinBacillus subtilis 29kB DNA fragment from ykwC gene to cseI5 gene.similar to hypothetical proteins
Contig352D	25554012_c2_109	1742	4579	213	71					
Contig352D	25667767_c3_131	1743	4580	1191	397	907	4.70E-91	Bacillus subtilis	e1183208	yjcIcystathionine beta-lyase homolog yjcIBacillus subtilis complete genome (section 7 of 21)similar to cystathionine beta-lyase

Contig352D	25679712_f3_59	1744	4581	660	220	153	1.40E-09	Schizosaccharomyces pombe	c317491	SPBC3D6.14unknownS.pombe chromosome II cosmid c3D6.SPBC3D6.14c, unknown; partial; serine rich,
Contig352D	26198535_c3_133	1745	4582	765	255	117	7.10E-07	Mycobacterium tuberculosis	e1253947	MTV048.03hypothetical protein MTV048.03Mycobacterium tuberculosis sequence v048.MTV048.03, len
Contig352D	26214002_f3_64	1746	4583	870	290	627	2.20E-61	Bacillus subtilis	P26497	spo01stage 0 sporulationB. subtilis DNA, 180 kilobase region of replication origin.
Contig352D	26365911_f1_3	1747	4584	561	187	203	1.90E-16	Bacillus subtilis	d1020119	yldeStranscriptional regulator (TetR/AcrR fami) homolog ydeSBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.PROBABLE TRANSCRIPTIONAL REGULATOR, SIMILAR TO
Contig352D	26600015_f1_1	1748	4585	354	118	280	1.30E-24	Bacillus subtilis	P25814	mpAprotein component of ribonuclease PB. subtilis DNA, 180 kilobase region of replication origin.
Contig352D	26756660_c2_121	1749	4586	651	217					
Contig352D	2745462_c1_81	1750	4587	642	214					
Contig352D	29860902_c3_132	1751	4588	2277	759	1816	2.20E-187	Bacillus subtilis	e1181518	metCMetCBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.
Contig352D	30080255_f1_7	1752	4589	384	128					
Contig352D	31443827_f2_46	1753	4590	510	170	563	1.30E-54	Bacillus subtilis	P37455	ssbsingle strand DNA binding proteinB. subtilis DNA, 180 kilobase region of replication origin.single-stranded DNA-binding protein homology
Contig352D	32062762_c2_123	1754	4591	183	61					
Contig352D	32423410_c1_91	1755	4592	210	70	167	1.20E-12	Archaeoglobus fulgidus	g2648767	AF1793repressor proteinArchaeoglobus fulgidus section 128 of 172 of the complete genome.similar to GB

Contig352D	3320317_f3_65	1756	4593	237	79	150	7.80E-11	Streptococcus pneumoniae	g2109447	Streptococcus pneumoniae R801 tRNA-Arg gene, partial sequence, and putative serine protease (sphtra), SPSPol (spspol), initiator protein (spdnaa) and beta subunit of DNA polymerase III (spdnan) genes, complete cds. ORFX
Contig352D	33228180_f1_16	1757	4594	243	81					
Contig352D	34180340_f2_33	1758	4595	711	237	609	1.80E-59	Enterococcus faecalis	d1025734	bacH Enterococcus faecalis plasmid pPD1 bacA, bacB, bacC, bacD, bacE, bacF, bacG, bacH and bacI genes, complete cds.
Contig352D	34182952_f3_58	1759	4596	402	134					
Contig352D	34414012_f1_22	1760	4597	273	91	336	1.50E-30	Bacillus subtilis	d1005761	rpsR Ribosomal protein S18B. subtilis DNA, 180 kilobase region of replication origin. Escherichia coli ribosomal protein S18
Contig352D	34414187_c1_82	1761	4598	399	133	152	4.80E-11	Bacillus subtilis	d1020108	ydeH hypothetical protein ydeH Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47. degree. FUNCTION UNKNOWN.
Contig352D	34417552_f3_53	1762	4599	381	127					
Contig352D	34580342_c1_94	1763	4600	771	257	802	6.40E-80	Bacillus subtilis	g2293177	ytsC transporter Bacillus subtilis rrmB-dnaB genomic region. similar to ABC transporter (ATP-binding protein)
Contig352D	34643751_c1_79	1764	4601	591	197	910	2.30E-91	Staphylococcus aureus	g1916316	ahpC alkyl hydroperoxide reductase subunit C Staphylococcus aureus alkyl hydroperoxide reductase subunit C (aphC) and subunit F (aphF) genes, complete cds. AhpC
Contig352D	34664700_f2_32	1765	4602	861	287	617	2.60E-60	Bacillus subtilis	p37524	yyaADNA binding protein (probable) B. subtilis DNA, 180 kilobase region of replication origin. unnamed protein product
Contig352D	35343807_f1_27	1766	4603	237	79					
Contig352D	35978127_f3_73	1767	4604	777	259	559	3.60E-54	Bacillus subtilis	p39605	ipa-43 hypothetical protein B. subtilis genomic region (325 to 333). alternate gene name



Contig352D	36228126_f2_31	1768	4605	1896	632	2407	5.30E-250	Bacillus subtilis	P25812	gidAunknownB. subtilis DNA, 180 kilobase region of replication origin.gidA proteinhomologous to E.coli gidA
Contig352D	36522507_f1_2	1769	4606	741	247	740	2.40E-73	Bacillus subtilis	P25813	gidBunknownB. subtilis DNA, 180 kilobase region of replication origin.gidB proteinhomologous to E.coli gidB
Contig352D	4353750_f1_4	1770	4607	600	200	158	1.70E-11	Clostridium perfringens	g853809	hypothetical protein 3C.perfringens nanH gene & ORF1,2,3 & 4. ORF3
Contig352D	4725385_f1_24	1771	4608	675	225	366	1.00E-33	Bacillus subtilis	e1183940	yrhPdihydrodipicolinate reductase homolog yrhPBacillus subtilis complete genome (section 14 of 21)similar to dihydrodipicolinate reductase
Contig352D	4957943_f3_68	1772	4609	600	200	205	6.00E-16	Caenorhabditis elegans	Q21122	K02B2.1Caenorhabditis elegans cosmid K02B2.Similar to 6-phosphofructo-2-kinase.
Contig352D	5313316_c2_118	1773	4610	1413	471	245	6.90E-38	Sulfolobus solfataricus	e283949	orf c01010sugar transporterS.solfataricus 100 kbp DNA fragment.
Contig352D	57217_c1_95	1774	4611	207	69					
Contig352D	582777_c2_103	1775	4612	1476	492	1405	8.00E-144	Bacillus subtilis	P54596	yhcl.hypothetical proteinB.subtilis chromosomal DNA (region 75 degressimilarity to the proton/sodium-glutamate symport
Contig352D	6644537_f1_9	1776	4613	258	86					
Contig352D	6715_c3_139	1777	4614	510	170					
Contig352D	6728578_c2_120	1778	4615	1893	631	678	8.80E-67	Bacillus subtilis	g2293178	ysdYsDBacillus subtilis rrmB-dnaB genomic region.similarity to NADH dehydrogenase
Contig352D	7297338_f1_15	1779	4616	213	71					
Contig352D	9773385_c1_78	1780	4617	816	272	303	4.80E-27	Escherichia coli	g2695682	hpcG2-oxo-hept-4-ene-1,7-dioate hydrataseEscherichia coli 2-oxo-hept-4-ene-1,7-dioate hydratase (hpcG) gene,complete cds.OHED hydratase
Contig352D	9792842_c1_89	1781	4618	1851	617	1480	9.10E-152	Bacillus subtilis	e1183103	yiUYtBacillus subtilis complete genome (section 6 of 21)similar to hypothetical proteins
Contig352D	9854643_f2_52	1782	4619	237	79					

Contig353D	11886592_f3_38	1783	4620	654	218	481	6.60E-46	Haemophilus influenzae	P44434	HI0475phosphoribosyl-AMP cyclohydrolase (hisE)Haemophilus influenzae from bases 492332 to 505971 (section 45 of 163) of the complete genome.hisI bifunctional enzymesimilar to SP
Contig353D	1207287_f3_36	1784	4621	621	207	365	1.30E-33	Lactococcus lactis	Q02129	hisGHisGLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisIE (hisIE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig353D	14480312_f2_15	1785	4622	1308	436	588	3.00E-57	Bacillus subtilis	e1182798	acoCacetoindehydrogenase E2 componentBacillus subtilis complete genome (section 5 of 21) alternate gene name
Contig353D	14662577_f1_7	1786	4623	537	179					
Contig353D	14725887_c2_53	1787	4624	183	61					
Contig353D	14851551_c3_64	1788	4625	993	331	1143	4.70E-116	Lactococcus lactis	g2565150	unknownLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisIE (hisIE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, II
Contig353D	14851713_f3_27	1789	4626	966	322	941	1.20E-94	Bacillus subtilis	g2957146	acoATPP-dependent acetoin dehydrogenase, E1Bacillus subtilis acetoin dehydrogenase enzyme system gene cluster, ribosomal protein L6-like protein gene, partial cds, TPP-dependent acetoin dehydrogenase, E1 alpha-subunit (acoA), TPP-dependent acetoin dehydrogen

Contig353D	16689067_f2_23	1790	4627	597	199	470	9.70E-45	Lactococcus lactis	Q02134	hisBHisBLactococcus lactis unknown gene, partial cds, and HisC (hisC), unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hisH), HisA (hisA), HisF (hisF), HisE (hisE), unknown, unknown, LeuA (leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, 1
Contig353D	21563751_c2_54	1791	4628	237	79					
Contig353D	22656300_c1_41	1792	4629	1542	514	1225	9.50E-125	Escherichia coli	P33940	yjyHyojH proteinE.coli genomic DNA, Kohara clone #373(49.5-49.9 min.).ORF ID
Contig353D	24070155_c1_40	1793	4630	495	165	279	1.70E-24	Bacillus subtilis	el183223	yjyFhypothetical protein yjyFBacillus subtilis complete genome (section 7 of 21)
Contig353D	24269812_c3_62	1794	4631	627	209	210	3.40E-17	Helicobacter pylori	g2314454	HP1286conserved hypothetical secreted proteinHelicobacter pylori section 111 of 134 of the complete genome.similar to EGAD
Contig353D	24640910_f3_28	1795	4632	519	173					
Contig353D	24652312_c3_65	1796	4633	1617	539	1125	3.80E-114	Bacillus subtilis	P54417	opuBputative transporterBacillus subtilis rrnB-dnaB genomic region.alternate gene name
Contig353D	24797900_f2_20	1797	4634	213	71					
Contig353D	25510293_f2_12	1798	4635	972	324	877	7.20E-88	Bacillus subtilis	el184489	ywtGmetabolite transport protein homolog ywtGBacillus subtilis complete genome (section 19 of 21)similar to metabolite transport protein
Contig353D	25666427_c2_60	1799	4636	306	102					
Contig353D	26385928_c1_46	1800	4637	1437	479	1441	1.20E-147	Bacillus subtilis	el182747	yflSYflSBacillus subtilis complete genome (section 5 of 21)similar to 2- oxoglutarate/malate translocator
Contig353D	26600425_c2_50	1801	4638	792	264	220	3.00E-18	Mus musculus	P50294	NAT1arylamine N-acetyltransferaseMus musculus arylamine N-acetyltransferase (NAT1) gene, completecds.

Contig353D	266877_c1_39	1802	4639	450	150	285	3.90E-25	Bacillus subtilis	d1020015	ydalBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. PROBABLE TRANSCRIPTIONAL REGULATOR, SIMILAR TO LEU
Contig353D	26751431_f1_4	1803	4640	1062	354	1037	8.00E-105	Bacillus subtilis	g2245638	acoBTPP-dependent acetoin dehydrogenase, E1Bacillus subtilis acetoin dehydrogenase enzyme system gene cluster, ribosomal protein L6-like protein gene, partial cds, TPP-dependent acetoin dehydrogenase, E1 alpha-subunit (acoA), TPP-dependent acetoin dehydrogen
Contig353D	2819803_f1_2	1804	4641	363	121	192	2.80E-15	Pseudomonas fluorescens	e308975	FC2.2hypothetical proteinP.fluorescens FC2.1, FC2.2, FC2.3c, FC2.4 and FC2.5c open reading frames. similar to E. coli RarD (SP)
Contig353D	3009382_f1_1	1805	4642	531	177					
Contig353D	30360925_c1_47	1806	4643	642	214	204	1.60E-16	Haemophilus influenzae	P44658	HI0357thiamine-repressed protein (hmt1) Haemophilus influenzae from bases 378525 to 389412 (section 35 of f163) of the complete genome. similar to GP
Contig353D	33988778_c1_43	1807	4644	660	220	636	2.50E-62	Staphylococcus aureus	g790573	peppyrrolidone carboxyl peptidaseStaphylococcus aureus pyrrolidone carboxyl peptidase (pcp) gene, complete cds. pyrase
Contig353D	35449093_f3_35	1808	4645	831	277					
Contig353D	36214052_f1_6	1809	4646	999	333	169	1.10E-10	Sulfolobus acidocaldarius	P46218	Sulfolobus acidocaldarius RNA polymerase subunit homolog gene, complete cds. homologous to Swiss-Prot Accession Number P20435
Contig353D	36228252_f1_11	1810	4647	777	259	678	8.80E-67	Bacillus subtilis	g2618870	hisFcytaseBacillus subtilis 300-304 degree genomic sequence. HisF protein

Contig353D	36366326_f3_26	1811	4648	771	257	409	2.80E-38	Bacillus subtilis	g3169320	yojDYojDBacillus subtilis YojA (yojA), YojB (yojB), YojC (yojC), YojD(yojD), YojE (yojE), YojF (yojF), YojG (yojG), YojH (yojH), YojI(yojI), YojJ (yojJ), YojK (yojK), YojL (yojL), YojM (yojM), YojN(yojN), and YojO (yojO) genes, complete cds; and OdhA (odh
Contig353D	4110712_f2_16	1812	4649	591	197					
Contig353D	4719827_f1_8	1813	4650	417	139					
Contig353D	4728187_f2_22	1814	4651	234	78					
Contig353D	5203452_f1_10	1815	4652	579	193	398	4.10E-37	Lactococcus lactis	Q02132	hishHisHLactococcus lactis unknown gene, partial cds, and HisC (hisC),unknown, HisG (hisG), unknown, HisB (hisB), unknown, HisH (hish),HisA (hisA), HisF (hisF), HisIE (hisIE), unknown, unknown, LeuA(leuA), LeuB (leuB), LeuC (leuC), LeuD (leuD), unknown, I
Contig353D	5963300_c1_45	1816	4653	504	168	114	7.40E-06	Pyrococcus horikoshii	d1027672	PHCK021192aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 478722-509861 nt position,clone
Contig353D	651527_f2_24	1817	4654	732	244	359	5.60E-33	Synechocystis sp.	P74561	hisAphosphorybosilformimino-5-amino-Synechocystis sp. PCC6803 complete genome, 26/27, 3270710-3418851. ORF_ID
Contig353D	6745250_f3_30	1818	4655	207	69					
Contig353D	7243832_f3_25	1819	4656	1722	574	249	2.00E-18	Methanococcus jannaschii	g1500527	MJ1628M. jannaschii predicted coding region MJ1628Methanococcus jannaschii section 145 of 150 of the complete genome.hypothetical protein; identified by GeneMark;
Contig353D	784387_f1_3	1820	4657	1425	475	769	2.00E-76	Clostridium magnum	g472330	dihydrolipoamide dehydrogenaseClostridium magnum acoR gene, complete cds; TPP-dependent acetoindehydrogenase alpha and beta subunit (acoAB) genes, complete cds;acoX gene, dihydrolipoamide acetyltransferase (acoCL) genes,complete cds.

Contig353D	798838_f1_9	1821	4658	1260	420	845	1.80E-84	Aquifex aeolicus	g2983343	hisD hisD histidinol dehydrogenase Aquifex aeolicus section 39 of 109 of the complete genome.
Contig354D	10240925_c3_196	1822	4659	252	84					
Contig354D	10553827_c1_151	1823	4660	216	72	128	1.70E-08	Bacillus subtilis	e1182777	yfkYrK Bacillus subtilis complete genome (section 5 of 21)
Contig354D	11125052_c2_173	1824	4661	1497	499	1715	1.10E-176	Bacillus subtilis	e1184252	yueK nicotinate phosphoribosyltransferase homolog yueK Bacillus subtilis complete genome (section 17 of 21) similar to nicotinate phosphoribosyltransferase
Contig354D	11755317_c1_148	1825	4662	759	253	135	3.70E-07	Bacillus subtilis	e1249815	yvqFYvqF protein Bacillus subtilis 42.7kB DNA fragment from yvqA to yvqA.
Contig354D	117687_c2_175	1826	4663	1377	459	1704	1.70E-175	Bacillus subtilis	P12047	purB adenylosuccinate lyase B. subtilis pur operon encoding purine biosynthesis enzymes, 12 genes. fumarate hydratase adenylosuccinate lyase (PUR-B)
Contig354D	1214075_f2_59	1827	4664	507	169	309	1.10E-27	Haemophilus influenzae	P43707	H11384 ferritin like protein (rsgA) Haemophilus influenzae from bases 1479577 to 1492547 (section 134 of 163) of the complete genome. similar to SP
Contig354D	12603166_f2_51	1828	4665	303	101	100	1.60E-05	Pyrococcus horikoshii	d1027339	PHBW012106aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position, clone
Contig354D	1287557_f3_98	1829	4666	213	71					
Contig354D	13678131_f2_83	1830	4667	840	280	299	1.30E-26	Bacillus subtilis	e1182580	ydiL hypothetical protein ydiL Bacillus subtilis complete genome (section 4 of 21) transmembrane
Contig354D	1377337_c1_152	1831	4668	840	280	602	9.90E-59	Staphylococcus aureus	g310603	Staphylococcus aureus DNA sequence encoding three ORFs, complete cds; prophage phi-11 sequence homology, 5' flank.
Contig354D	13837927_c3_206	1832	4669	1155	385	621	9.60E-61	Staphylococcus aureus	P06696	tnpA tnpA protein Staphylococcus aureus transposon Tn554 (aa 1-361)

Contig354D	13851088_c1_128	1833	4670	1089	363	185	5.10E-14	Caenorhabditis elegans	g1947171	E03H12.5Caenorhabditis elegans cosmid E03H12.coded for by C. elegans cDNA yk170g3.5
Contig354D	1385927_c2_176	1834	4671	711	237	851	4.10E-85	Staphylococcus aureus	Q53726	pcrApcrB proteinStaphylococcus aureus helicase required for T181 replication (pcrA) gene, complete cds.
Contig354D	1414005_c2_191	1835	4672	579	193	324	2.90E-29	Bacillus subtilis	cl182857	ygaChypothetical 12.2 kd proteinBacillus subtilis complete genome (section 5 of 21)
Contig354D	14581306_f2_76	1836	4673	303	101	115	4.00E-07	Bacillus subtilis	cl183598	yoiDunknownBacillus subtilis complete genome (section 12 of 21) similar to hypothetical proteins from B. subtilis
Contig354D	14714077_c2_177	1837	4674	1209	403	715	1.10E-70	Bacillus subtilis	cl182643	yerHYerH proteinBacillus subtilis complete genome (section 4 of 21)
Contig354D	14883592_c2_168	1838	4675	2076	692	600	1.60E-58	Clostridium butyricum	g436133	hypothetical proteinC.butyricum transposon containing tbcC gene.product is similar to TnpB of transposon Tn554 from
Contig354D	15041430_c3_220	1839	4676	249	83					
Contig354D	15121077_c2_178	1840	4677	1476	492	1626	3.10E-167	Bacillus subtilis	cl182648	yerMamidase homolog yerMBacillus subtilis complete genome (section 4 of 21) alternate gene name
Contig354D	16219007_f2_74	1841	4678	921	307	1319	1.00E-134	Enterococcus faecalis	P00807	blaZbeta-lactamaseE.faecalis beta-lactamase mRNA, complete cds.beta-lactamase Ibeta-lactamase (aa 1-281)
Contig354D	16677343_c2_162	1842	4679	447	149	111	1.10E-06	Methanococcus jannaschii	Q57803	MJ0357M.jannaschii predicted coding region MJ0357Methanococcus jannaschii section 31 of 150 of the complete genome.hypothetical protein; identified by GeneMark;
Contig354D	16693300_f2_54	1843	4680	1113	371	586	4.90E-57	Bacillus subtilis	cl182859	ygaEhypothetical 40.7 kd proteinBacillus subtilis complete genome (section 5 of 21)
Contig354D	19536693_c1_143	1844	4681	318	106	232	1.60E-19	Bacillus subtilis	g2589194	gatCGlu-tRNA <sup>Gln</sup> amidotransferase subunit CBacillus subtilis Glu-tRNA <sup>Gln</sup> amidotransferase subunits C (gatC), A(gatA) and B (gatB) genes, complete cds.similar to Synechocystis sp. hypothetical protein,

Contig354D	1958183_f3_119	1845	4682	648	216	943	7.30E-95	Staphylococcus epidermidis	g2981297	agrBAgrBStaphylococcus epidermidis agr system including response regulator(agrA), histidine kinase (agrC), AgrD (agrD), AgrB (agrB) and delatoxin (hld) genes, complete cds.required for peptide pheromone production; similar
Contig354D	1972278_f2_53	1846	4683	300	100	316	2.00E-28	Bacillus subtilis	e1182860	gsaBgutamate-1-semialdehyde aminotransferaseBacillus subtilis complete genome (section 5 of 21)
Contig354D	1988811_c1_154	1847	4684	1083	361	779	1.70E-77	Bacillus subtilis	e1182852	yfhQYfhQBacillus subtilis complete genome (section 5 of 21) similar to A/G-specific adenine glycosylase
Contig354D	19957567_c3_222	1848	4685	291	97	94	7.30E-05	Mitochondrion Cepaea nemoralis	g881925	NADH dehydrogenase subunit 6Cepaea nemoralis complete mitochondrial genome.followed by putative incomplete stop codon 'TA'
Contig354D	20344411_c3_198	1849	4686	336	112	440	1.50E-41	Staphylococcus epidermidis	p48227	hsp10heat shock protein 10Staphylococcus epidermidis 9759 heat shock protein 10 (hsp10) and heat shock protein 60 (hsp60) genes, complete cds.
Contig354D	2037838_f1_29	1850	4687	249	83	122	7.30E-08	Pyrococcus horikoshii	d1027966	PHAL027134aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 734966-774775 nt position, clone
Contig354D	20706500_f1_40	1851	4688	339	113	158	1.10E-11	Kinetoplast Bodo saltans	g3037018	ND5NADH dehydrogenase subunit 5Bodo saltans NADH dehydrogenase subunit 5 (ND5) mRNA, kinetoplastgene encoding kinetoplast protein, partial cds.partially edited mRNA
Contig354D	20735686_f3_108	1852	4689	957	319	853	2.50E-85	Bacillus subtilis	p37487	yybQunknownB. subtilis DNA, 180 kilobase region of replication origin.similar to hypothetical proteins
Contig354D	20881510_c3_199	1853	4690	492	164	213	1.70E-17	Bacillus subtilis	g2293169	ytrAtranscription regulatorBacillus subtilis irnB-dnaB genomic region.similar to transcriptional regulator (GntR family)



Contig354D	21616078_c2_174	1854	4691	192	64	135	3.00E-09	Bacillus subtilis g2239294	yebG unknown Bacillus subtilis CotA (cotA), GabP (gabP), YeaB (yeaB), YeaC (yeaC), YeaA (yeaA), GMP synthetase (guaA) genes, complete cds, and AIR carboxylase I (purE) gene, partial cds.yebG
Contig354D	21676433_c1_138	1855	4692	1137	379	192	2.80E-12	Streptomyces coelicolor e1292355	SC1A6.07c hypothetical protein SC1A6.07c Streptomyces coelicolor cosmid 1A6.SC1A6.07c, unknown, len
Contig354D	22289077_c3_203	1856	4693	546	182				
Contig354D	23438461_c2_163	1857	4694	687	229				
Contig354D	23495437_f1_39	1858	4695	1305	435	1004	2.50E-101	Bacillus circulans e216734	aspAT aspartate aminotransferase B. circulans aspartate aminotransferase gene.
Contig354D	23572125_c3_224	1859	4696	534	178	393	1.40E-36	Bacillus subtilis P49851	YKHABacillus subtilis hmp DNA for 7 ORFs, complete cds. low homology to P14 protein of Heamophilus
Contig354D	23595386_c2_193	1860	4697	627	209	271	1.20E-23	Bacillus subtilis e1186156	yvcT glycerate dehydrogenase homolog yvcTBacillus subtilis complete genome (section 18 of 21) similar to glycerate dehydrogenase
Contig354D	23629202_c2_170	1861	4698	381	127	598	2.60E-58	Staphylococcus aureus P18415	blalbeta-lactamase repressor S.aureus Tn552 transposable element regulatory protein blalblal protein (AA 1-126)
Contig354D	23672562_c2_161	1862	4699	297	99				
Contig354D	23727212_f1_12	1863	4700	303	101				
Contig354D	23727250_f2_72	1864	4701	1395	465	1167	1.30E-118	Bacillus subtilis P39616	ipa-58aldehyde dehydrogenase homolog ywdHB. subtilis genomic region (325 to 333). alternate gene name
Contig354D	23850907_f3_116	1865	4702	201	67				
Contig354D	24218791_f3_107	1866	4703	588	196	525	1.40E-50	Bacillus subtilis e1184253	yueJ pyrazinamidase/nicotinamidase homolog yueJBacillus subtilis complete genome (section 17 of 21) similar to pyrazinamidase/nicotinamidase
Contig354D	24257827_c3_200	1867	4704	387	129				

Contig354D	24353382_c1_127	1868	4705	1623	541	2592	1.30E-269	Staphylococcus epidermidis	g535342	hsp60heat shock protein 60Staphylococcus epidermidis 9759 heat shock protein 10 (hsp10) and heat shock protein 60 (hsp60) genes, complete cds.
Contig354D	24407787_c2_192	1869	4706	354	118					
Contig354D	24415942_c3_205	1870	4707	840	280					
Contig354D	24429688_c2_158	1871	4708	327	109					
Contig354D	24885938_c1_140	1872	4709	642	214	302	6.10E-27	Bacillus subtilis	g2239293	yebFUnknownBacillus subtilis CotA (cotA), GabP (gabP), YeaB (yeaB), YeaC(yeaC), YebA (yebA), GMP synthetase (guaA) genes, complete cds, and AIR carboxylase I (purE) gene, partial cds.yebF
Contig354D	25428507_c2_182	1873	4710	576	192					
Contig354D	25595387_f3_111	1874	4711	432	144	111	1.10E-06	Bacillus subtilis	e1183598	yoiDUnknownBacillus subtilis complete genome (section 12 of 21)similar to hypothetical proteins from B. subtilis
Contig354D	25603388_f3_120	1875	4712	1293	431	2112	9.70E-219	Staphylococcus epidermidis	g2981295	agrChistidine kinaseStaphylococcus epidermidis agr system including response regulator(agrA), histidine kinase (agrC), AgrD (agrD), AgrB (agrB) and deltaxin (hld) genes, complete cds.AgrC; similar to S. aureus and S. lugdunensis AgrC
Contig354D	256265_c3_221	1876	4713	1092	364	538	6.00E-52	Bacillus subtilis	e1249816	yvqEYvqE proteinBacillus subtilis 42.7kB DNA fragment from yvqA to yvqA.similar to two-component sensor histidine kinase
Contig354D	25678438_c3_230	1877	4714	474	158	334	2.50E-30	Aquifex aeolicus	g2983147	aq_495hypothetical proteinAquifex aeolicus section 24 of 109 of the complete genome.
Contig354D	25781392_f3_97	1878	4715	1029	343	225	4.80E-17	Bacillus subtilis	e1182859	ygaEhypothetical 40.7 kd proteinBacillus subtilis complete genome (section 5 of 21)

Contig354D	25790718_c3_211	1879	4716	315	105	349	6.40E-32	Bacillus subtilis	g2465565	yecDYecDBacillus subtilis phosphoribosylaminoimidazole-carboxamideformyltransferase (purH-I) gene, partial cds,phosphoribosylglycinamide synthetase (purD), YecA (yecA), putativeadenine deaminase (yecB), YecC (yecC), and YecD (yecD) genes,complete cds, and
Contig354D	26177163_c2_185	1880	4717	1272	424	971	7.80E-98	Bacillus subtilis	P39762	ampSaminopeptidaseBacillus subtilis ampS-nprE gene region.similar to ampS gene with GenBank Accession Number
Contig354D	26209577_f2_69	1881	4718	1068	356	892	1.80E-89	Bacillus subtilis	cl182753	yfIMYfIMBacillus subtilis complete genome (section 5 of 21)similar to nitric-oxide synthase
Contig354D	26212875_cl_130	1882	4719	318	106					
Contig354D	26354787_c3_194	1883	4720	744	248					
Contig354D	26593808_fl_5	1884	4721	981	327	753	9.90E-75	Bacillus subtilis	cl182851	yfhrPYfhrPBacillus subtilis complete genome (section 5 of 21)
Contig354D	26689703_cl_157	1885	4722	453	151	562	1.70E-54	Bacillus subtilis	cl182862	ygaGhypothetical 16.4 kd proteinBacillus subtilis complete genome (section 5 of 21)similar to transcriptional regulator (Fur family)
Contig354D	26756500_cl_147	1886	4723	777	259	721	2.40E-71	Bacillus subtilis	cl182759	yfIGYfIGBacillus subtilis complete genome (section 5 of 21)similar to methionine aminopeptidase
Contig354D	26757312_f2_58	1887	4724	1197	399	543	1.80E-52	Bacillus subtilis	cl182780	yfKHYfKHBacillus subtilis complete genome (section 5 of 21)similar to transporter
Contig354D	2939187_f3_90	1888	4725	198	66					
Contig354D	2992943_c2_166	1889	4726	624	208	324	2.90E-29	Bacillus subtilis	g2293170	yftrBtransporterBacillus subtilis rrmB-dnaB genomic region.similar to ABC transporter (ATP-binding protein)
Contig354D	32037826_c2_180	1890	4727	1476	492	1119	1.60E-113	Bacillus subtilis	cl182653	yefARNA methyltransferase homolog yefABacillus subtilis complete genome (section 4 of 21)alternate gene name
Contig354D	3251577_cl_141	1891	4728	2190	730	3095	0	Staphylococcus aureus	Q53727	pcrAHelicaseStaphylococcus aureus helicase required for T181 replication (pcrA)gene, complete cds.

Contig354D	32689162_f2_85	1892	4729	807	269	1384	1.30E-141	Staphylococcus epidermidis	g2981299	orf5 unknown agr system including response regulator (agrA), histidine kinase (agrC), AgrD (agrD), AgrB (agrB) and delta toxin (hld) genes, complete cds. similar to S. aureus and S. lugdunensis orf5
Contig354D	32696088_c3_228	1893	4730	1749	583	1899	3.60E-196	Bacillus subtilis	e1182858	ygaD unidentified transporter-ATP binding Bacillus subtilis complete genome (section 5 of 21) similar to ABC transporter (ATP-binding protein)
Contig354D	33631292_c2_183	1894	4731	414	138					
Contig354D	3392952_c2_160	1895	4732	591	197	195	1.30E-15	Bacteriophage phi16	e247149	Rorf172 Lactobacillus bacteriophage phage complete genomic DNA.
Contig354D	34275325_c3_227	1896	4733	1521	507	238	4.20E-17	Bacillus subtilis	P42954	tagH ATP-binding protein Bacillus subtilis 168 highly hydrophobic integral membrane protein (tagG) gene and ATP-binding protein (tagH) gene, complete cds.
Contig354D	34383400_c1_131	1897	4734	582	194					
Contig354D	34572177_c3_202	1898	4735	735	245	147	1.20E-08	Staphylococcus epidermidis	g459263	membrane spanning protein (putative) S. epidermidis (968) genes for potential ABC transporter and potential membrane spanning protein.
Contig354D	34652177_c1_149	1899	4736	648	216	546	8.50E-53	Bacillus subtilis	e1249817	yvqCYvqC protein Bacillus subtilis 42.7kDa DNA fragment from yvqA to yvqA similar to two-component response regulator [YvqE]
Contig354D	35443785_c3_219	1900	4737	207	69					
Contig354D	35885_f2_78	1901	4738	504	168					
Contig354D	36119093_c1_142	1902	4739	2001	667	2102	1.10E-217	Bacillus subtilis	e1182642	yerGDNA ligase homolog ycrGBacillus subtilis complete genome (section 4 of 21) similar to DNA ligase

Contig354D	36195250_f2_70	1903	4740	822	274	375	1.10E-34	Methanococcus jannaschii	Q58054	MJ0637chorismate mutase/prephenate dehydratase (pheA)Methanococcus jannaschii section 53 of 150 of the complete genome.prephenate dehydratase homologysimilar to SP
Contig354D	36219692_c1_145	1904	4741	561	187	133	2.00E-08	Streptococcus sobrinus	d1003084	parrepressor proteinStreptococcus sobrinus gene for repressor protein of surfaceprotein antigen gene (pag), complete cds. This ORF2 starts at the GTG codon (position 1162)
Contig354D	36220000_c3_207	1905	4742	1047	349	557	5.80E-54	Bacillus subtilis	e1181502	ykgBYkgBBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.similar to hypothetical proteins
Contig354D	36367302_c1_123	1906	4743	564	188	122	2.30E-06	Methanococcus jannaschii	Q57805	MJ0359M. jannaschii predicted coding region MJ0359Methanococcus jannaschii section 31 of 150 of the complete genome.hypothetical protein; identified by GeneMark;
Contig354D	36522175_f3_102	1907	4744	1557	519	2240	2.60E-232	Staphylococcus aureus	g2565311	putPhigh affinity proline permeaseStaphylococcus aureus high affinity proline permease (putP) gene,complete cds.
Contig354D	39077_f1_42	1908	4745	717	239	1223	1.60E-124	Staphylococcus epidermidis	g2981294	agrAresponse regulatorStaphylococcus epidermidis agr system including response regulator(agrA), histidine kinase (agrC), AgrD (agrD), AgrB (agrB) and deltatoxin (hld) genes, complete cds.AgrA; similar to S. aureus and S. lugdunensis AgrA
Contig354D	3939013_c3_225	1909	4746	210	70	109	1.70E-06	Bacillus subtilis	e1182787	yfjTYfjTBacillus subtilis complete genome (section 5 of 21)
Contig354D	3942015_c2_187	1910	4747	528	176	790	1.20E-78	Staphylococcus aureus	g310602	Staphylococcus aureus DNA sequence encoding three ORFs, completedcds; prophage phi-11 sequence homology, 5' flank.
Contig354D	4021888_c1_129	1911	4748	669	223					
Contig354D	4062500_c3_197	1912	4749	1401	467	488	9.70E-46	Staphylococcus aureus	g397526	clumping factorS.aureus gene for clumping factor.
Contig354D	4089763_f3_95	1913	4750	501	167	358	7.10E-33	Bacillus subtilis	e1182778	yfkJYfkJBacillus subtilis complete genome (section 5 of 21)similar to protein-tyrosine phosphatase

Contig354D	4095277_c1_135	1914	4751	1827	609	2760	2.10E-287	Staphylococcus aureus	g152966	blaR1bla regulator protein blaR1Staphylococcus aureus blaZ gene, 5' end; blaR1 gene, complete cds;blaI gene, complete cds; and binR gene, 5' end.beta-lactamase OXA2 homology
Contig354D	4101517_f3_113	1915	4752	1068	356					
Contig354D	4179637_c1_133	1916	4753	387	129	207	7.10E-17	Staphylococcus aureus	P06698	tnpCpot. tnpC proteinStaphylococcus aureus transposon Tn554.(aa 1-125)
Contig354D	430325_c2_181	1917	4754	1383	461	522	3.00E-50	Synechocystis sp.	d1019130	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 16/27, 1991550-2137258. ORF ID
Contig354D	4689130_f1_43	1918	4755	306	102					
Contig354D	4722265_c2_188	1919	4756	858	286	416	5.10E-39	Bacillus subtilis	e1182842	yfhGYfthGBacillus subtilis complete genome (section 5 of 21)
Contig354D	4726566_f1_18	1920	4757	582	194	155	2.30E-11	Aquifex acolicus	g2983450	dnaQDNA polymerase III epsilon subunitAquifex aeolicus section 46 of 109 of the complete genome.
Contig354D	4728377_f1_10	1921	4758	1146	382	544	1.40E-52	Bacillus subtilis	e1182785	yfRBYfRBBacillus subtilis complete genome (section 5 of 21)
Contig354D	4900443_c2_179	1922	4759	1440	480	2460	1.30E-255	Bacillus subtilis	Q45486	YZDDPET112-like proteinBacillus subtilis PET112-like protein gene, complete cds.
Contig354D	5167268_c1_146	1923	4760	1080	360	613	6.80E-60	Escherichia coli	Q47155	dinPhytophthical protein DinPEscherichia coli K-12 MG1655 section 21 of 400 of the completegenome.o351; 100 pct identical to GB
Contig354D	5860052_f2_80	1924	4761	435	145	107	2.80E-06	Pyrococcus horikoshii	d1028904	PHCY019133aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1552268-1595600 nt position,clone
Contig354D	6053308_c3_210	1925	4762	903	301	815	2.70E-81	Escherichia coli	P18843	nadE, cfr, ntrL, NH(3)-dependent NAD(+) synthetase (EC 6.3.5.1)E.coli genomic DNA, Kohara clone #326(39.1-39.4 min.).spore outgrowth factor BORF_ID
Contig354D	6147252_c2_189	1926	4763	846	282	150	1.30E-08	Bacillus subtilis	P42953	tagGhighly hydrophobic integral membrane proteinBacillus subtilis 168 highly hydrophobic integral membrane protein(tagG) gene and ATP-binding protein (tagH) gene, complete cds.

Contig354D	632661_c3_218	1927	4764	777	259	301	7.80E-27	Mycobacterium tuberculosis	e1264573	MTV025.061hypothetical protein MTV025.061Mycobacterium tuberculosis sequence v025.MTV025.061, len
Contig354D	6682627_c1_125	1928	4765	357	119	123	5.70E-08	Paramecium bursaria Chlorella virus 1	g624123	a58LParamecium bursaria Chlorella virus 1, complete genome.contains Glu-, Gln-rich regions
Contig354D	6829687_c3_201	1929	4766	618	206	355	1.50E-32	Staphylococcus aureus	g459256	stpCPotential ABC transporterS.aureus (RN4220) genes for potential ABC transporter and potentialmembrane spanning protein.
Contig354D	6931261_c2_159	1930	4767	537	179	128	1.70E-08	Staphylococcus aureus	g2689551	Staphylococcus aureus toxic shock syndrome toxin-1 (tst),enterotoxin (ent), and integrase (int) genes, complete cds.orf4
Contig354D	7164087_c3_226	1931	4768	333	111	217	6.20E-18	Bacillus subtilis	e1182843	yfhHYfHbBacillus subtilis complete genome (section 5 of 21)
Contig354D	7207518_f1_41	1932	4769	375	125	151	6.10E-11	Glycine max	B27059	hypothetical protein 2
Contig354D	799188_f3_118	1933	4770	468	156	202	7.60E-15	Plasmodium falciparum	g9826	11-111-1 polypeptidePlasmodium falciparum 11-1 gene part 1.
Contig354D	820325_f1_3	1934	4771	948	316	1131	8.70E-115	Bacillus subtilis	P71084	gsaBgltamate-1-semialdehyde aminotransferaseB.subtilis 25 kb genomic DNA segment (from sspE to katA).
Contig354D	959635_f2_55	1935	4772	294	98	98	7.30E-05	TRYPANOSO MA BRUCEI BRUCEI	P24499	MURF4ATP SYNTHASE A CHAIN, (PROTEIN 6)
Contig354D	979712_c2_169	1936	4773	1422	474					
Contig354D	985678_c1_144	1937	4774	975	325	889	3.80E-89	Bacillus subtilis	e1182652	yerQconserved hypothetical protein yerQBacillus subtilis complete genome (section 4 of 21)similar to hypothetical proteins
Contig355D	10972150_c3_125	1938	4775	2055	685	3024	0	Staphylococcus aureus	d1025491	recGRecGStaphylococcus aureus recG gene, complete cds.
Contig355D	114626_f3_61	1939	4776	207	69					
Contig355D	1204567_c2_104	1940	4777	750	250	481	6.60E-46	Bacillus subtilis	e1185167	yloOptative Ptc1 proteinBacillus subtilis complete genome (section 9 of 21)similar to hypothetical proteins

Contig355D	1209638_c1_80	1941	4778	540	180	642	5.70E-63	Staphylococcus aureus	P31024	Ispprolipoprotein signal peptidaseStaphylococcus aureus prolipoprotein signal peptidase (lsp) gene, complete cds.lipoprotein signal peptidase
Contig355D	13720312_c3_119	1942	4779	240	80	117	2.50E-07	Bacillus subtilis	e1185160	ylolPutative rpoZ proteinBacillus subtilis complete genome (section 9 of 21)
Contig355D	1376317_c2_98	1943	4780	564	188	481	6.60E-46	Lactobacillus plantarum	e199384	pyrRL-plantarum pyrimidine biosynthetic operon (pyrR, pyrB, pyrC, pyrAA, pyrAB, pyrD, pyrF, and pyrE) genes.
Contig355D	19557752_c1_81	1944	4781	912	304	844	2.30E-84	Bacillus subtilis	P05654	pyrBAspartate transcarbamylaseB.subtilis pyrB gene encoding aspartate transcarbamoylase, completecds.ornithine carbamoyltransferaseaspartate transcarbamoylase (EC 2.1.3.2)
Contig355D	209840_f1_10	1945	4782	195	65					
Contig355D	2242938_c3_112	1946	4783	933	311	1055	9.80E-107	Bacillus subtilis	Q45480	YL YBBacillus subtilis signal peptidase II (lsp) gene, complete cds, isoleucyl-tRNA synthetase (ileS) and pyrR genes, partial cds.orf-X; hypothetical protein; Method
Contig355D	22461078_c1_79	1947	4784	735	245	814	3.40E-81	Staphylococcus aureus	g1314301	ORFunknownStaphylococcus aureus isoleucyl-tRNA synthetase (ileS) gene, partial cds.
Contig355D	22462802_c3_120	1948	4785	1203	401	1070	2.50E-108	Bacillus subtilis	e1185161	ylolPutative Dfp proteinBacillus subtilis complete genome (section 9 of 21)similar to pantothenate metabolism flavoprotein
Contig355D	23492327_f1_8	1949	4786	204	68	126	2.70E-08	Synechocystis sp.	d1011491	clpPhyothetical proteinSynecocystis sp. PCC6803 complete genome, 25/27, 3138604-3270709. ORF_ID
Contig355D	23572253_c1_92	1950	4787	741	247	623	5.90E-61	Bacillus subtilis	e1185184	rncSribonuclease IIIBacillus subtilis complete genome (section 9 of 21)alternate gene name
Contig355D	23632962_c2_97	1951	4788	810	270	270	1.50E-23	Bacillus subtilis	P54721	yfiEunknownBacillus subtilis complete genome (section 5 of 21)similar to hypothetical proteins from B. subtilis



Contig355D	23642217_c1_88	1952	4789	648	216	396	6.70E-37	Bacillus subtilis	e1185171	yloSYloS proteinBacillus subtilis complete genome (section 9 of 21)
Contig355D	23647178_c2_106	1953	4790	633	211	398	4.10E-37	Bacillus subtilis	e1185179	yloCYpC proteinBacillus subtilis complete genome (section 9 of 21)
Contig355D	23650293_c1_85	1954	4791	627	209	693	2.30E-68	Bacillus subtilis	e1185159	yloDputative Gmk proteinBacillus subtilis complete genome (section 9 of 21) similar to guanylate kinase
Contig355D	23836036_c2_100	1955	4792	192	64	153	9.70E-10	Bacillus caldolyticus	P46537	PyrAacarbamoyl-phosphate synthaseB. caldolyticus pyrimidine biosynthesis genes.carbamoyl-phosphate synthase (glutamine-hydrolyzing) large chain
Contig355D	24240676_c3_62	1956	4793	246	82					
Contig355D	24297217_c1_82	1957	4794	3114	1038	3756	0	Bacillus caldolyticus	P46537	PyrAacarbamoyl-phosphate synthaseB. caldolyticus pyrimidine biosynthesis genes.carbamoyl-phosphate synthase (glutamine-hydrolyzing) large chain
Contig355D	24355342_c1_95	1958	4795	1014	338	1265	5.50E-129	Bacillus subtilis	P37105	ffhsignal recognition particleBacillus subtilis complete genome (section 9 of 21)
Contig355D	24406291_c2_105	1959	4796	417	139	369	4.90E-34	Bacillus subtilis	e1185174	yloUputative Asp23 proteinBacillus subtilis complete genome (section 9 of 21) similar to alkaline-shock protein
Contig355D	24407327_c3_117	1960	4797	612	204	623	5.90E-61	Bacillus subtilis	A30492	pyrEorotate phosphoribosyltransferase, orotate phosphoribosyltransferase
Contig355D	24407936_c2_103	1961	4798	1122	374	1380	3.60E-141	Bacillus subtilis	e1185166	yloNYloN proteinBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	24422077_c3_115	1962	4799	1101	367	1196	1.10E-121	Bacillus caldolyticus	P52557	PyrAacarbamoyl-phosphate synthaseB. caldolyticus pyrimidine biosynthesis genes.carbamoyl-phosphate synthase (glutamine-hydrolyzing) small chain homology
Contig355D	24424038_c1_89	1963	4800	1692	564	1538	6.50E-158	Bacillus subtilis	e1185175	yloVYloV proteinBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins

Contig355D	24609637_c3_108	1964	4801	798	266	445	4.30E-42	Bacillus subtilis	e1185129	yImD conserved hypothetical protein yImDBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	24632827_c1_86	1965	4802	963	321	917	4.10E-92	Bacillus subtilis	e1185164	fmimethionyl-tRNA formyltransferaseBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	24645025_c3_114	1966	4803	1284	428	1287	2.60E-131	Bacillus caldolyticus	P46538	PyrC dihydroorotaseB. caldolyticus pyrimidine biosynthesis genes.Bacillus dihydroorotase
Contig355D	24648412_c1_94	1967	4804	402	134	302	6.10E-27	Bacillus subtilis	P37104	yLxMORF1Bacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	25635962_c3_111	1968	4805	486	162	274	5.70E-24	Staphylococcus aureus	e244971	S.aureus orfs 1,2,3 & 4. ORF1
Contig355D	25816552_c3_109	1969	4806	777	259	468	1.60E-44	Bacillus subtilis	g1518679	yImHcell-division protein homolog yImHBacillus subtilis minicell-associated protein (divIVA) gene, complete cds, and isoleucyl-tRNA-synthetase (ileS) gene, partialcds.orf
Contig355D	26423305_c1_78	1970	4807	336	112	226	6.90E-19	Bacillus subtilis	e1185132	yImG conserved hypothetical protein yImGBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	26598402_c3_113	1971	4808	1314	438	1251	1.70E-127	Bacillus caldolyticus	P41006	PyrPuracil permeaseB. caldolyticus (DSM405) pyrR, pyrP and pyrB (partial) genes.
Contig355D	26614167_c1_91	1972	4809	240	80	238	3.70E-20	Bacillus subtilis	P80643	acpAacyl carrier proteinBacillus subtilis complete genome (section 9 of 21)acyl carrier proteinalternate gene name
Contig355D	29320217_f2_32	1973	4810	207	69					
Contig355D	30656300_c3_122	1974	4811	1353	451	912	1.40E-91	Bacillus subtilis	e1185165	yloMputative Fmu proteinBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	3314128_f2_23	1975	4812	234	78					
Contig355D	34017812_f3_63	1976	4813	1722	574	1369	5.20E-140	Bacillus subtilis	e332190	yloAputative fibronectin-binding proteinBacillus subtilis pyrE to yloA gene region, protein A-like

Contig355D	34642213_c2_96	1977	4814	615	205	328	1.10E-29	Bacillus subtilis	e1185131	yimF conserved hypothetical protein yimFBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	34650452_c1_83	1978	4815	225	75					
Contig355D	35978392_c1_87	1979	4816	2007	669	949	1.70E-95	Bacillus subtilis	e1185168	yloPputative Pkn2 proteinBacillus subtilis complete genome (section 9 of 21) similar to protein kinase
Contig355D	36141893_c3_127	1980	4817	1248	416	1166	1.70E-118	Bacillus subtilis	e1185186	ftsY signal recognition particle (docking protein)Bacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	3912890_f3_57	1981	4818	222	74	246	5.30E-21	BACILLUS STEAROTHERMOPHILUS	P23374	RPMBribosomal protein L2850S RIBOSOMAL PROTEIN L28
Contig355D	4509661_c1_84	1982	4819	411	137					
Contig355D	4725000_c1_93	1983	4820	3636	1212	2426	5.10E-252	Bacillus subtilis	e1185185	smc chromosome segregation SMC protein homologBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	4741703_c2_102	1984	4821	2418	806	2153	4.40E-223	Bacillus subtilis	e1185162	priA primosomal replication factor Y (primosomalBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	4875055_f1_3	1985	4822	225	75					
Contig355D	4875452_c3_124	1986	4823	645	215	518	7.90E-50	Bacillus subtilis	e1185170	yloRputative CfxE proteinBacillus subtilis complete genome (section 9 of 21) similar to ribulose-5-phosphate 3-epimerase
Contig355D	4877203_c1_90	1987	4824	936	312	661	5.60E-65	Bacillus subtilis	e1185181	fabDmalonyl CoA-acyl carrier protein transacylaseBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	4970462_c2_107	1988	4825	750	250	837	1.20E-83	Bacillus subtilis	e1185182	fabG3-ketoacyl-acyl carrier protein reductaseBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	5096012_f3_64	1989	4826	231	77					
Contig355D	5276712_c3_116	1990	4827	708	236	659	9.10E-65	Lactococcus lactis	P50924	pyrFOMP decarboxylaseL.lactis pyrD and pyrF genes.

Contig355D	5978453_c3_121	1991	4828	492	164	261	1.40E-22	Bacillus subtilis	P94462	defolypeptide deformylaseB.subtilis priA, def, fnt, sun genes.alternate gene name
Contig355D	6072125_c1_77	1992	4829	672	224	591	1.50E-57	Bacillus subtilis	e1185130	yImE conserved hypothetical protein yImEBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	6149077_c3_123	1993	4830	891	297	708	5.80E-70	Bacillus subtilis	e1185169	yloQYloQ proteinBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig355D	642_c3_110	1994	4831	2784	928	4356	0	Staphylococcus aureus	P41972	ileSisoleucyl-tRNA synthetaseS.aureus gene for isoleucyl-tRNA synthetase.
Contig355D	7225000_c3_126	1995	4832	1026	342	898	4.30E-90	Bacillus subtilis	e1185180	plsXputative PlsX proteinBacillus subtilis complete genome (section 9 of 21) alternate gene name
Contig355D	892141_f2_44	1996	4833	396	132	208	5.60E-17	Pyrococcus horikoshii	d1027160	PHBC037103aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1-37345 and 1737608-1738505nt position (complementary strand), clone
Contig355D	990702_c1_76	1997	4834	1185	395	1801	8.70E-186	Staphylococcus aureus	P45498	ftsZFtsZStaphylococcus aureus SA4 FtsZ (ftsZ) gene, complete cds.cell division protein ftsZ
Contig355D	9954640_f3_67	1998	4835	228	76	117	2.50E-07	Enterococcus faecalis	g2196686	pyrABpyrimidine biosynthesis protein AbEnterococcus faecalis plasmid pKV48 pyrimidine biosynthesis proteinAb (pyrAb) gene, partial cds.
Contig356D	10719452_c2_53	1999	4836	684	228	371	3.00E-34	Bacillus subtilis	P54175	ypiQhemolysin III homolog homolog ypiQBacillus subtilis (YAC10-9 clone) DNA region between the serA andkdg loci.20.2% identity with NADH dehydrogenase of the
Contig356D	10752342_c1_40	2000	4837	981	327	773	7.50E-77	Bacillus subtilis	e1182740	yfmEYfmEBacillus subtilis complete genome (section 5 of 21) similar to ferrichrome ABC transporter (permease)
Contig356D	10928_c2_61	2001	4838	414	138					
Contig356D	12142768_f2_12	2002	4839	300	100	110	3.50E-06	Pyrococcus horikoshii	d1027343	PHBW016235aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 180023-216005 nt position,clone

[illegible]

Contig356D	24490930_c2_60	2018	4855	912	304	1220	3.20E-124	Bacillus subtilis	P37527	yaaDunknownB. subtilis DNA, 180 kilobase region of replication origin. similar to hypothetical proteins
Contig356D	24641927_c3_63	2019	4856	1380	460	978	1.40E-98	Bacillus firmus	P30267	hypothetical protein AB.firmus ORF A and ORF B, complete cds. ORF A; putative
Contig356D	24855303_c2_47	2020	4857	1047	349	784	5.10E-78	Bacillus subtilis	e1182741	yfmDYfmDBacillus subtilis complete genome (section 5 of 21) similar to ferrichrome ABC transporter (permease)
Contig356D	277312_c3_65	2021	4858	1353	451	423	9.20E-40	Bacillus subtilis	e1184366	yusPmultidrug-efflux transporter homolog yusPBacillus subtilis complete genome (section 17 of 21) similar to multidrug-efflux transporter
Contig356D	285808_f3_25	2022	4859	225	75					
Contig356D	29376066_c3_62	2023	4860	183	61	109	8.70E-06	Bacillus subtilis	e1182742	yfmCYfmCBacillus subtilis complete genome (section 5 of 21) similar to ferrichrome ABC transporter (binding)
Contig356D	3361326_c1_44	2024	4861	207	69					
Contig356D	33348182_f3_29	2025	4862	231	77					
Contig356D	4100327_f1_6	2026	4863	360	120	133	5.00E-09	Bacillus subtilis	e1182694	yetGHypothetical protein yetGBacillus subtilis complete genome (section 4 of 21)
Contig356D	6854675_f2_17	2027	4864	279	93	119	1.50E-07	Bacillus subtilis	e1183408	ynzGHypothetical protein ynzGBacillus subtilis complete genome (section 10 of 21)
Contig356D	797308_f3_37	2028	4865	189	63					
Contig357D	10439005_f2_28	2029	4866	516	172	143	4.30E-10	Pyrococcus horikoshii	d1028459	PHAU021101aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 1195819-1238496 nt position, clone
Contig357D	11728376_c1_51	2030	4867	249	83	241	1.80E-20	Bacillus subtilis	e1184298	yuzBHypothetical protein yuzBBacillus subtilis complete genome (section 17 of 21)
Contig357D	14538202_c2_54	2031	4868	762	254	1034	1.70E-104	Bacillus subtilis	e1184349	yurYABC transporter (ATP-binding protein) homolog yurYBacillus subtilis complete genome (section 17 of 21) similar to ABC transporter (ATP-binding protein)
Contig357D	14970251_f3_29	2032	4869	294	98					

Contig357D	21681702_c3_73	2033	4870	198	66	163	1.80E-11	Bacillus subtilis	e1184289	yumBNADH dehydrogenaseBacillus subtilis complete genome (section 17 of 21)similar to NADH dehydrogenase
Contig357D	21883512_c2_56	2034	4871	225	75					
Contig357D	22462926_c3_68	2035	4872	783	261	669	7.90E-66	Bacillus subtilis	e1184308	yutFN-acetyl-glucosamine catabolism homolog yutFBacillus subtilis complete genome (section 17 of 21)similar to N-acetyl-glucosamine catabolism
Contig357D	23475892_c3_67	2036	4873	1362	454	707	7.40E-70	Bacillus subtilis	e1184316	yunDconserved hypothetical protein yunDBacillus subtilis complete genome (section 17 of 21)similar to hypothetical proteins
Contig357D	23728412_c2_53	2037	4874	699	233	726	7.20E-72	Bacillus subtilis	e1184352	yusBconserved hypothetical protein yusBBacillus subtilis complete genome (section 17 of 21)similar to hypothetical proteins
Contig357D	24033567_c1_47	2038	4875	450	150	207	7.10E-17	Bacillus subtilis	e1184309	yutEhypothetical protein yutEBacillus subtilis complete genome (section 17 of 21)
Contig357D	24242285_c2_57	2039	4876	1056	352	414	8.30E-39	Borrelia burgdorferi	g2688091	BB0202hemolysin, putativeBorrelia burgdorferi (section 16 of 70) of the complete genome.similar to PID
Contig357D	24415930_f3_31	2040	4877	1068	356	977	1.80E-98	Bacillus subtilis	e1184299	yutJNADH dehydrogenase homolog yutJBacillus subtilis complete genome (section 17 of 21)similar to NADH dehydrogenase
Contig357D	24803332_c1_40	2041	4878	840	280	712	2.20E-70	Bacillus subtilis	e1184351	yusAconserved hypothetical protein yusABacillus subtilis complete genome (section 17 of 21)similar to hypothetical proteins
Contig357D	26190785_c1_41	2042	4879	1287	429	1408	3.90E-144	Bacillus subtilis	e1184347	yurWNifS protein homolog yurWBacillus subtilis complete genome (section 17 of 21)similar to NifS protein homolog
Contig357D	26360663_c2_63	2043	4880	1176	392	877	7.20E-88	Bacillus subtilis	e1184289	yumBNADH dehydrogenaseBacillus subtilis complete genome (section 17 of 21)similar to NADH dehydrogenase
Contig357D	26376077_c3_64	2044	4881	192	64	101	1.20E-05	Bacillus subtilis	e276829	ywmHunknownB.subtilis atpC gene.

Contig357D	26594050_c2_61	2045	4882	243	81	378	5.40E-35	Staphylococcus aureus	d1013748	dltCD-alanyl carrier proteinStaphylococcus aureus gene for unknown function and dlt operon dltA,dltB,dltC and dltD genes,complete cds.Sequence homologous to the dltC genes of
Contig357D	30198587_f1_1	2046	4883	258	86	306	2.30E-27	Bacillus subtilis	e1184301	yurNifU protein homolog homolog yurDBacillus subtilis complete genome (section 17 of 21)similar to NifU protein homolog
Contig357D	30265692_c2_60	2047	4884	1050	350	675	1.80E-66	Pyrococcus horikoshii	d1027703	PHAB011376aa long hypothetical dehydrogenasePyrococcus horikoshii OT3 genomic DNA, 512441-547109 nt position(complementary strand), clonecontains ATP/GTP-binding site motif A (P-loop) ;
Contig357D	31876563_c3_69	2048	4885	1239	413	1924	8.10E-199	Staphylococcus aureus	d1013747	dltBhypothetical membrane transporterStaphylococcus aureus gene for unknown function and dlt operon dltA,dltB,dltC and dltD genes,complete cds.Sequence homologous to the dltB genes of
Contig357D	33628441_f1_5	2049	4886	255	85					
Contig357D	33645967_f2_19	2050	4887	282	94					
Contig357D	34069680_c3_70	2051	4888	213	71					
Contig357D	34242162_c2_55	2052	4889	489	163	529	5.40E-51	Bacillus subtilis	e1184346	yurV'NifU protein homolog homolog yurV'Bacillus subtilis complete genome (section 17 of 21)similar to NifU protein homolog
Contig357D	34251887_c1_49	2053	4890	1266	422	1047	6.90E-106	Staphylococcus aureus	d1013749	dltDextramembranal proteinStaphylococcus aureus gene for unknown function and dlt operon dltA,dltB,dltC and dltD genes,complete cds.putative
Contig357D	36563_c1_39	2054	4891	1074	358	908	3.70E-91	Bacillus subtilis	e1184353	yusCABC transporter (ATP-binding protein) homolog yusCBacillus subtilis complete genome (section 17 of 21)similar to ABC transporter (ATP-binding protein)





Contig357D	6929512_c3_66	2067	4904	1416	472	2098	2.90E-217	Bacillus subtilis	e1184345	yurU conserved hypothetical protein yurUBacillus subtilis complete genome (section 17 of 21) similar to hypothetical proteins
Contig357D	989010_c3_72	2068	4905	408	136	371	3.00E-34	Bacillus subtilis	e1184295	yutM conserved hypothetical protein yutMBacillus subtilis complete genome (section 17 of 21) similar to hypothetical proteins
Contig358D	10025277_f1_12	2069	4906	396	132	101	3.70E-05	Aquifex aeolicus	g2982842	aq_106 putative protein Aquifex aeolicus section 5 of 109 of the complete genome.
Contig358D	10553766_f3_73	2070	4907	195	65					
Contig358D	1058463_c2_138	2071	4908	2121	707	2472	6.90E-257	Bacillus subtilis	P50849	pnpA polynucleotide phosphorylase Bacillus subtilis ribosomal protein RpsO (rpsO) gene, partial cds, and polynucleotide phosphorylase (pnpA) gene, complete cds. alternate gene name
Contig358D	1074090_c3_146	2072	4909	906	302	697	8.50E-69	Bacillus subtilis	P39776	codV CodV Bacillus subtilis JH642 dipeptide permease operon regulators, codV, codW, codX, and codY genes, complete cds.
Contig358D	1183337_c1_110	2073	4910	447	149	303	4.80E-27	Bacillus subtilis	P32727	ORF2 transcription termination- antitermination factor nusA homolog B.subtilis infB-nusA operon.
Contig358D	11930317_c2_136	2074	4911	336	112	251	1.60E-21	Bacillus subtilis	P32729	ORF4 hypothetical protein 2 (infB 5' region) B.subtilis infB-nusA operon alternate gene name
Contig358D	19735887_c3_165	2075	4912	1581	527	1924	8.10E-199	Bacillus subtilis	e1185292	ymcB conserved hypothetical protein ymcBBacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig358D	20423127_c2_143	2076	4913	2676	892	2302	7.10E-239	Bacillus subtilis	e1185295	mutSDNA mismatch repair (recognition) mutSBacillus subtilis complete genome (section 9 of 21)
Contig358D	20504512_c1_119	2077	4914	1758	586	685	3.40E-79	Halobacterium halobium	g43498	ferredoxin oxidoreductase H.halobium gene for pyruvate alpha-subunit; pyruvate synthase

Contig358D	205327_c1_106	2078	4915	1332	444	1679	7.40E-173	Bacillus subtilis	e1185204	gidglucose-inhibited division proteinBacillus subtilis complete genome (section 9 of 21)alternate gene name
Contig358D	21912535_f2_56	2079	4916	420	140					
Contig358D	22368803_c1_115	2080	4917	2397	799	1659	9.70E-171	Bacillus subtilis	P21458	spoIIIDNA translocaseBacillus subtilis complete genome (section 9 of 21)
Contig358D	22444075_c2_127	2081	4918	873	291	381	2.60E-35	Bacillus subtilis	e1185202	smfDNA processing Smf protein homologBacillus subtilis complete genome (section 9 of 21)
Contig358D	22470463_c2_142	2082	4919	810	270	881	2.70E-88	Bacillus subtilis	e1185288	ymdBconserved hypothetical protein ymdBBacillus subtilis complete genome (section 9 of 21)similar to hypothetical proteins
Contig358D	22850885_c3_163	2083	4920	1596	532	1799	1.40E-185	Bacillus subtilis	e1185287	ymdAconserved hypothetical protein ymdABacillus subtilis complete genome (section 9 of 21)similar to hypothetical proteins
Contig358D	23445463_c2_130	2084	4921	801	267	1002	4.10E-101	Bacillus subtilis	e1185240	rpsBribosomal protein S2Bacillus subtilis complete genome (section 9 of 21)
Contig358D	23472175_c2_137	2085	4922	417	139	360	4.40E-33	Bacillus subtilis	P32731	ORF6ribosome-binding factor AB.subtilis infB-nusA operon.Escherichia coli protein P15BAlternate gene name
Contig358D	23554760_f1_6	2086	4923	255	85					
Contig358D	23632758_c3_145	2087	4924	258	86					
Contig358D	23633467_c1_113	2088	4925	987	329	659	9.10E-65	Bacillus subtilis	e269877	ribCFMN adenylyltransferaseB.subtilis ribC, rpsO and pnpA genes.riboflavin kinase
Contig358D	23650250_c3_147	2089	4926	546	182	667	1.30E-65	Bacillus subtilis	P39070	codWCodWBacillus subtilis JH642 dipeptide permease operon regulators, codV, codW, codX, and codY genes, complete cds.alternate gene name
Contig358D	24033217_c1_112	2090	4927	930	310	720	3.10E-71	Bacillus subtilis	e1185257	truBRNA pseudouridine 55 synthaseBacillus subtilis complete genome (section 9 of 21)alternate gene name

Contig358D	24267941_c3_158	2091	4928	726	242	304	3.80E-27	Bacillus subtilis	e1185272	ynfCtranscriptional regulator (GntR family) homolog ynfCBacillus subtilis complete genome (section 9 of 21) similar to transcriptional regulator (GntR family)
Contig358D	24414818_c3_153	2092	4929	870	290	952	8.10E-96	Bacillus subtilis	e1185251	nusAtranscription termination nusABacillus subtilis complete genome (section 9 of 21)
Contig358D	24492827_f2_63	2093	4930	2601	867	1069	3.20E-108	Bacillus subtilis	e1182850	yfhOYfhOBacillus subtilis complete genome (section 5 of 21)
Contig358D	24792776_c1_109	2094	4931	528	176	371	3.00E-34	Bacillus subtilis	P32726	ORF1 protein P15A homologB.subtilis infB-nusA operon.nus operon 15K proteinalternate gene name
Contig358D	24886550_c3_156	2095	4932	288	96	350	5.00E-32	Bacillus subtilis	e269878	rpsOribosomal protein S15B.subtilis ribC, rpsO and pnpA genes.
Contig358D	24886677_c2_134	2096	4933	1722	574	1885	1.10E-194	Bacillus subtilis	e1185248	proSprolyl-tRNA synthetaseBacillus subtilis complete genome (section 9 of 21)
Contig358D	24900332_c1_124	2097	4934	981	327	935	5.10E-94	Bacillus subtilis	P49850	mutLMutLBacillus subtilis spore coat protein (cotE) gene, partial cds, and mismatch repair recognition proteins (mutS) and (mutL) genes, complete cds.
Contig358D	25587942_c2_126	2098	4935	786	262	556	7.40E-54	Bacillus subtilis	e1185197	rmhribonuclease HBacillus subtilis complete genome (section 9 of 21)
Contig358D	25665937_c2_132	2099	4936	558	186	841	4.70E-84	Staphylococcus aureus	g2645713	friribosome recycling factorStaphylococcus aureus ribosome recycling factor (fir) gene, complete cds.
Contig358D	26257806_c2_144	2100	4937	984	328	707	7.40E-70	Bacillus subtilis	P49850	mutLMutLBacillus subtilis spore coat protein (cotE) gene, partial cds, and mismatch repair recognition proteins (mutS) and (mutL) genes, complete cds.
Contig358D	26306257_c1_105	2101	4938	2073	691	2490	8.50E-259	Bacillus subtilis	P39814	topADNA topoisomerase IBacillus subtilis (smf) gene, 3' end, DNA topoisomerase gene, completecds, (gid) gene, 5' end.alternate gene name

Contig358D	26353417_c3_164	2102	4939	294	98	141	7.00E-10	Clostridium perfringens	g498839	hypothetical protein 2Clostridium perfringens JIR4025 extracellular toxin production regulatory locus ORF1 and ORF3 genes, partial cds, and ORF2, ORF10c, virR, virS, and ORF4 genes, complete cds. ORF2
Contig358D	26370703_c2_125	2103	4940	285	95					
Contig358D	26460951_c1_108	2104	4941	792	264	917	4.10E-92	Bacillus subtilis	e1185242	smbAuridyrate kinase Bacillus subtilis complete genome (section 9 of 21)
Contig358D	275427_c3_157	2105	4942	1722	574	1379	4.60E-141	Bacillus subtilis	e1185269	ymfA conserved hypothetical protein ymfABacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig358D	30656317_c1_107	2106	4943	822	274	858	7.40E-86	Bacillus subtilis	p39779	codY CodY Bacillus subtilis JH642 dipeptide permease operon regulators, codV, codW, codX, and codY genes, complete cds.
Contig358D	31552_c3_166	2107	4944	522	174					
Contig358D	31697151_c1_101	2108	4945	315	105	441	1.10E-41	Bacillus subtilis	e1185195	rplS ribosomal protein L19 Bacillus subtilis complete genome (section 9 of 21)
Contig358D	3257827_c1_116	2109	4946	705	235	356	1.20E-32	Bacillus subtilis	e1185278	ymf13-oxoacyl-acyl-carrier protein reductase homolog ymf1Bacillus subtilis complete genome (section 9 of 21) similar to 3-oxoacyl-acyl-carrier protein
Contig358D	32611557_c2_131	2110	4947	294	98	316	2.00E-28	Bacillus subtilis	e1185241	tsf elongation factor TsBacillus subtilis complete genome (section 9 of 21)
Contig358D	33283167_c2_140	2111	4948	1338	446	967	2.10E-97	Bacillus subtilis	e1185277	ymfH processing proteinase homolog ymfHBacillus subtilis complete genome (section 9 of 21) similar to processing protease
Contig358D	33800901_f2_41	2112	4949	318	106	127	2.10E-08	Leishmania tarentolae	S51910	cryptogene protein G4
Contig358D	34571877_c3_159	2113	4950	1275	425	372	2.30E-34	Bacillus subtilis	e1185276	ymfG processing proteinase homolog ymfGBacillus subtilis complete genome (section 9 of 21) similar to processing protease

Contig358D	34663177_c1_118	2114	4951	1167	389	641	1.70E-65	Bacillus subtilis	g1842440	cinACinABacillus subtilis tRNA-Ala, phosphatidylglycerophosphate synthase(pgsA) and CinA (cinA) genes, complete cds, and RecA (recA) gene, partial cds.
Contig358D	35370318_c1_104	2115	4952	930	310	1274	6.10E-130	Bacillus subtilis	e1185201	sucDsuccinyl-CoA synthetase (alpha subunit)Bacillus subtilis complete genome (section 9 of 21)
Contig358D	36220061_c2_129	2116	4953	1425	475	1399	3.50E-143	Bacillus subtilis	P39778	codXCodXBacillus subtilis JH642 dipeptide permease operon regulators, codV, codW, codX, and codY genes, complete cds.alternate gene name
Contig358D	36225938_c1_103	2117	4954	1185	395	1557	6.30E-160	Bacillus subtilis	e1185200	sucCsuccinyl-CoA synthetase (beta subunit)Bacillus subtilis complete genome (section 9 of 21)
Contig358D	40686_c3_152	2118	4955	4089	1363	6425	0	Staphylococcus aureus	d1013849	DNA polymerase IIIStaphylococcus aureus DNA for DNA polymerase III, complete cds.
Contig358D	4093818_c1_117	2119	4956	591	197	436	3.90E-41	Bacillus subtilis	P46322	pgs1APgsABacillus subtilis pgs1A gene for phosphatidylglycerophosphatesynthase, complete cds.PgsA
Contig358D	4095286_c1_123	2120	4957	375	125	246	5.30E-21	Bacillus subtilis	e1185293	ymcAconserved hypothetical protein ymcABacillus subtilis complete genome (section 9 of 21)similar to hypothetical proteins
Contig358D	4336536_c3_154	2121	4958	315	105	211	2.70E-17	Bacillus subtilis	P32728	ORF3conserved hypothetical protein ylxRB.subtilis infB-nusA operon.alternate gene name
Contig358D	4425068_f3_100	2122	4959	2613	871	880	3.40E-88	Bacillus subtilis	e1182850	yfhOYfhOBacillus subtilis complete genome (section 5 of 21)
Contig358D	4572162_c2_133	2123	4960	1290	430	932	1.10E-93	Bacillus subtilis	e1185247	yluCconserved hypothetical protein yluCBacillus subtilis complete genome (section 9 of 21)similar to hypothetical proteins
Contig358D	5195328_c3_161	2124	4961	393	131	142	1.90E-09	Bacillus subtilis	g1842438	unknownBacillus subtilis tRNA-Ala, phosphatidylglycerophosphate synthase(pgsA) and CinA (cinA) genes, complete cds, and RecA (recA) gene, partial cds. ORF307; hypothetical 34.7 kd protein

Contig358D	5198557_c3_149	2125	4962	801	267	691	3.70E-68	Bacillus subtilis	e1185244	yluA conserved hypothetical protein yluA Bacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig358D	5212776_c1_102	2126	4963	867	289	839	7.60E-84	Bacillus subtilis	e1185196	ylqF conserved hypothetical protein ylqF Bacillus subtilis complete genome (section 9 of 21) similar to hypothetical proteins
Contig358D	6678140_c2_135	2127	4964	348	116	328	3.10E-28	Staphylococcus aureus	g642270	DNA polymerase IIIS.aureus gene for DNA polymerase III.
Contig358D	6688126_c3_162	2128	4965	1074	358	1661	6.00E-171	Staphylococcus aureus	Q02350	recA Staphylococcus aureus recA gene, complete cds putative
Contig358D	6837812_c3_150	2129	4966	786	262	611	1.10E-59	Bacillus subtilis	e1185245	cds Aphosphatidate cytidyl transferase Bacillus subtilis complete genome (section 9 of 21)
Contig358D	6933390_c3_167	2130	4967	552	184	402	1.60E-37	Bacillus subtilis	P30300	glpP regulatory protein Bacillus subtilis antiterminal regulatory protein (glpP), glycerol uptake facilitator (glpF) genes, complete cds, glycerol kinase (glpK) gene, 5' end see EMBL M99611 and Swiss Prot P30300.
Contig358D	7064077_c3_155	2131	4968	2187	729	2508	1.10E-260	Bacillus subtilis	P17889	IF2 translation initiation factor IF- 2B. subtilis protein synthesis initiation factor 2 (infB) gene, complete cds. translation initiation factor IF-2 protein synthesis initiation factor 2 (infB)
Contig358D	891700_c1_120	2132	4969	867	289	599	2.10E-58	Halobacterium halobium	g43499	ferredoxin oxidoreductase H.halobium gene for pyruvate pyruvate synthase beta chain beta-subunit; pyruvate synthase
Contig358D	9767263_c1_121	2133	4970	639	213	280	1.30E-24	Bacillus subtilis	e1185518	yoqZ phage-related protein homolog yoqZ Bacillus subtilis complete genome (section 11 of 21) similar to phage-related protein
Contig358D	9804202_c3_148	2134	4971	627	209	704	1.50E-69	Bacillus subtilis	e1185241	tsf elongation factor Ts Bacillus subtilis complete genome (section 9 of 21)

Contig358D	9807807_c3_160	2135	4972	873	291	522	3.00E-50	Bacillus subtilis	g1842437	unknownBacillus subtilis tRNA-Ala, phosphatidylglycerophosphate synthase(pgsA) and CinA (cinA) genes, complete cds, and RecA (recA) gene, partial cds.hypothetical 17.9 kDa protein; ORF158
Contig359D	10406642_f1_17	2136	4973	342	114	165	2.30E-12	Bacillus subtilis	P39756	narQunknownB.subtilis atpC gene.alternate gene name
Contig359D	1054640_f3_85	2137	4974	213	71	170	6.00E-13	Bacillus subtilis	P39756	narQunknownB.subtilis atpC gene.alternate gene name
Contig359D	10928_c1_113	2138	4975	1242	414	234	3.50E-17	Rhodobacter capsulatus	g3128293	hypothetical proteinRhodobacter capsulatus strain SB1003, partial genome.
Contig359D	1209800_c2_148	2139	4976	282	94					
Contig359D	12588250_f1_40	2140	4977	198	66					
Contig359D	12595175_f2_62	2141	4978	498	166	261	1.40E-22	Bacillus subtilis	P49856	ykkCYkkCBacillus subtilis hmp DNA for 7 ORFs, complete cds.unnamed protein product
Contig359D	1261078_c1_111	2142	4979	579	193	471	7.60E-45	Bacillus subtilis	P42085	xptadenine phosphoribosyltransferaseBacillus subtilis (YAC10-9 clone) DNA region between the serA andkdg loci.27% identity with E.coli adenine
Contig359D	1375308_c2_160	2143	4980	411	137	96	4.10E-05	Staphylococcus aureus	g684950	sarAStaphylococcal accessory regulator AStaphylococcus aureus staphylococcal accessory regulator A (sarA)gene, complete cds.
Contig359D	13849056_c1_120	2144	4981	279	93					
Contig359D	14097586_f3_90	2145	4982	438	146	470	9.70E-45	Staphylococcus xylosus	P42874	ureBurease beta subunitS.xylosus gene for ureA, ureB, and ureC genes for urease gamma,beta and alpha subunits.urease 12K chain
Contig359D	14460882_f1_10	2146	4983	189	63	221	2.30E-18	Staphylococcus haemolyticus	g1022726	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds.ORF1
Contig359D	14549010_c2_158	2147	4984	666	222	185	1.50E-14	Bacillus subtilis	e1185016	mobAmolybdopterin-guanine dinucleotide biosynthesisBacillus subtilis complete genome (section 8 of 21)



Contig359D	I5033181_f3_109	2148	4985	444	148								
Contig359D	I9533567_f2_50	2149	4986	264	88								
Contig359D	I21611592_f3_102	2150	4987	369	123								
Contig359D	I21646015_f2_52	2151	4988	210	70	158	1.10E-11	Staphylococcus haemolyticus	g1022725	unknownStaphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completecds.ORF2			
Contig359D	I21675050_f3_100	2152	4989	360	120								
Contig359D	I21681561_f1_32	2153	4990	891	297	776	3.60E-77	Bacillus subtilis	e1182103	ybbIconserved hypothetical protein ybbIBacillus subtilis complete genome (section 1 of 21)similar to hypothetical proteins			
Contig359D	I21776942_c1_116	2154	4991	642	214	855	1.50E-85	Bacillus subtilis	e1182158	ybxGaminic acid permease homolog ybxGBacillus subtilis complete genome (section 2 of 21)alternate gene name			
Contig359D	I2211433_f3_93	2155	4992	867	289	534	1.60E-51	Bacillus sp.	Q07400	UreDurease accessory proteinThermophilic Bacillus genes for urease subunits and ureaseaccessory proteins, complete cds.			
Contig359D	I22290657_c3_177	2156	4993	387	129	157	1.40E-11	Staphylococcus aureus	g684950	sarAStaphylococcal accessory regulator ASStaphylococcus aureus staphylococcal accessory regulator A (sarA)gene, complete cds.			
Contig359D	I22692177_c1_131	2157	4994	537	179	391	2.30E-36	Bacillus subtilis	g2293241	moaBputative molybdenum cofactor biosynthesisBacillus subtilis rmB-dnaB genomic region.			
Contig359D	I23538427_f2_73	2158	4995	309	103	132	6.80E-09	Pyrococcus horikoshii	d1027429	PHCD003215aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 270845-299829 nt position,clonecontains prokaryotic membrane lipoprotein lipid			
Contig359D	I23609628_c2_153	2159	4996	975	325	385	9.80E-36	Trypanosoma brucei brucei	g2645495	inosine-adenosine-guanosine-nucleosideTrypanosoma brucei inosine-adenosine-guanosine-nucleosidehydrolase mRNA, complete cds.N-ribohydrolase; IAG-nucleoside hydrolase			

Contig359D	23620260_c2_150	2160	4997	1107	369	334	2.50E-30	Arthrobacter sp.	d1008736	opine dehydrogenaseArthrobacter sp. gene for opine dehydrogenase, complete cds.
Contig359D	23631551_c3_183	2161	4998	792	264					
Contig359D	23642167_f3_81	2162	4999	1218	406	611	1.10E-59	Bacillus subtilis	e1184551	ywoGunknown similar to quinolon resistance proteinBacillus subtilis complete genome (section 19 of 21)similar to antibiotic resistance protein
Contig359D	23678262_c3_182	2163	5000	573	191	370	3.80E-34	Bacillus subtilis	e1183039	yhfUhypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to biotin biosynthesis
Contig359D	24104677_c2_143	2164	5001	1656	552	1619	1.70E-166	Bacillus subtilis	P54715	glvCphosphotransferase system (PTS) arbutin-likeBacillus subtilis complete genome (section 5 of 21)alternate gene name
Contig359D	24234562_f2_75	2165	5002	222	74					
Contig359D	24257012_c1_128	2166	5003	735	245	480	8.40E-46	Synechocystis sp.	d1011427	ABC transporterSynecocystis sp. PCC6803 complete genome, 24/27, 3002966-3138603.unassigned ATP-binding cassette proteinsORF_ID
Contig359D	24314818_c2_159	2167	5004	1035	345	923	9.60E-93	Bacillus subtilis	P39757	narAMozA-like proteinB.subtilis atpC gene.alternate gene name
Contig359D	24406577_c2_162	2168	5005	3156	1052	2317	1.80E-240	Bacillus subtilis	e1182651	yerPacri flavin resistance protein homolog yerPBacillus subtilis complete genome (section 4 of 21)similar to acriflavin resistance protein
Contig359D	24431532_c1_135	2169	5006	1254	418	343	2.80E-31	Staphylococcus hominis	e329240	femAStaphylococcus hominis femA gene.
Contig359D	24616251_f2_63	2170	5007	696	232	139	2.20E-07	Streptomyces peucetius	g567887	dnrOptutative repressorStreptomyces peucetius TDP-D-glucose-4,6-dehydratase (dnrM) gene,3' end, regulatory protein (dnrN) gene, complete cds, and repressorprotein (dnrO) gene, complete cds.putative
Contig359D	24644008_c3_184	2171	5008	792	264	408	3.60E-38	Bacillus subtilis	e1249786	yvgLputative molybdate binding protein, YvgLBacillus subtilis 42.7kB DNA fragment from yvsA to yvqA.alternate gene name

Contig359D	24647292_c3_164	2172	5009	1275	425	1180	5.60E-120	Bacillus subtilis	P42086	ypaQ transport protein Bacillus subtilis (YAC10-9 clone) DNA region between the serA and kgd loci. 26% of identity to the Bacillus caldolyticus uracil
Contig359D	25430317_c1_132	2173	5010	492	164	215	1.00E-17	Bacillus subtilis	e1185019	mobB molybdopterin-guanine dinucleotide biosynthesis Bacillus subtilis complete genome (section 8 of 21)
Contig359D	25443838_c2_149	2174	5011	789	263	448	2.10E-42	Staphylococcus aureus	d1023468	NAG Staphylococcus aureus DNA for N- acetyl-glucosaminidase, partial cds.
Contig359D	25554213_f1_20	2175	5012	627	209	943	7.30E-95	Staphylococcus xylosus	P42877	UREG UreG GS.xylosus (C2a) UreF and UreG genes.
Contig359D	25554675_f3_110	2176	5013	237	79					
Contig359D	25582885_f1_9	2177	5014	453	151	153	3.80E-11	Bacillus subtilis	e1184550	ywoH unknown, similar to cytolysin SlyA from Bacillus subtilis complete genome (section 19 of 21) similar to transcriptional regulator (MarR family)
Contig359D	25679762_c1_119	2178	5015	831	277	374	1.40E-34	Bacillus subtilis	g1377843	yktC unknown Bacillus subtilis ampS-nprE gene region. similar to E.coli extragenic suppressor protein
Contig359D	26182800_c1_134	2179	5016	813	271					
Contig359D	26375031_f1_2	2180	5017	195	65					
Contig359D	26758426_c2_151	2181	5018	750	250	107	8.80E-06	Staphylococcus aureus	g684950	sarA Staphylococcus aureus staphylococcal accessory regulator A (sarA) gene, complete cds.
Contig359D	29494067_c3_167	2182	5019	213	71					
Contig359D	29697752_c2_147	2183	5020	786	262	499	8.20E-48	Bacillus subtilis	Q02115	lytR membrane bound protein Bacillus subtilis membrane bound protein (lytA and lytR); amidase enhancer (lytB); and amidase (lytC) genes, complete cds's.
Contig359D	3250075_f3_96	2184	5021	1008	336	705	1.20E-69	Pyrococcus horikoshii	d1027703	PHAB011376aa long hypothetical dehydrogenase Pyrococcus horikoshii OT3 genomic DNA, 512441-547109 nt position (complementary strand), clone contains ATP/GTP-binding site motif A (P-loop);

Contig359D	33360910_f3_95	2185	5022	549	183	120	1.20E-07	Synechocystis sp.	d1017705	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 4/27, 402290-524345. ORF ID
Contig359D	3371062_f1_3	2186	5023	333	111					
Contig359D	3401887_c1_112	2187	5024	1485	495	1969	1.40E-203	Bacillus subtilis	d1005787	guaBIMP dehydrogenaseB. subtilis DNA, 180 kilobase region of replication origin. IMP dehydrogenasealternate gene name
Contig359D	34192165_f1_26	2188	5025	345	115	264	6.50E-23	Bacillus subtilis	e1181510	ykdykDBacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR. similar to chaparonin
Contig359D	34411552_f2_58	2189	5026	1722	574	2703	2.30E-281	Staphylococcus xylosum	P42873	ureCurease alpha subunitS. xylosum gene for ureA, ureB, and ureC genes for urease gamma, beta and alpha subunits. urease 62K chain
Contig359D	34431300_c2_146	2190	5027	774	258	139	2.40E-09	Enterococcus faecalis	d1011987	orf8ORF8Enterococcus faecalis plasmid pY117 genes for BacA, BacB, ORF3, ORF4, ORF5, ORF6, ORF7, ORF8, ORF9, ORF10, ORF11, partial cds.
Contig359D	34617187_f2_69	2191	5028	207	69					
Contig359D	35944052_f1_44	2192	5029	690	230					
Contig359D	36113805_c1_117	2193	5030	750	250	775	4.60E-77	Bacillus subtilis	e1182158	ybxGamino acid permease homolog ybxGBacillus subtilis complete genome (section 2 of 21) alternate gene name
Contig359D	36132792_c3_187	2194	5031	255	85	127	2.10E-08	Synechocystis sp.	d1011104	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 22/27, 2755703-2868766. ORF ID
Contig359D	36134427_c1_115	2195	5032	657	219	251	1.60E-21	Bacillus subtilis	P54607	yhcWhypothetical proteinB. subtilis chromosomal DNA (region 75 degreessimilarity to phosphoglycolate phosphatase from
Contig359D	36147301_c3_165	2196	5033	237	79					
Contig359D	36209660_f2_55	2197	5034	378	126					
Contig359D	36225625_f1_22	2198	5035	795	265	1034	1.70E-104	Staphylococcus aureus	e244971	S. aureus orfs 1,2,3 & 4. ORF1

Contig359D	36615903_c2_152	2199	5036	1164	388	1007	1.20E-101	Bacillus subtilis	d1020042	ydbMbutryl-CoA dehydrogenase homolog, ydbM Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. SIMILAR TO ACYL-COA DEHYDROGENASE.
Contig359D	3947153_f3_92	2200	5037	456	152	482	5.20E-46	Bacillus sp.	Q07401	UreE urease accessory protein Thermophilic Bacillus genes for urease subunits and urease accessory proteins, complete cds.
Contig359D	4042327_c3_180	2201	5038	918	306	309	1.10E-27	Homo sapiens	g1322222	RACHIRACHIH Human RACH1 (RACH1) mRNA, complete cds.
Contig359D	4086568_c3_176	2202	5039	1983	661	130	1.50E-07	Escherichia coli	P22339	soxS regulatory protein SoxS Escherichia coli K-12 MG1655 section 369 of 400 of the complete genome. f107; 100 pct identical amino acid sequence and
Contig359D	4305342_c2_142	2203	5040	1557	519	2015	1.80E-208	Bacillus subtilis	g2239288	guaA GMP synthetase Bacillus subtilis CotA (cotA), GabP (gabP), YeaB (yeaB), YeaC (yeaC), YebA (yebA), GMP synthetase (guaA) genes, complete cds, and AIR carboxylase 1 (purE) gene, partial cds. alternate gene name
Contig359D	4459380_f1_39	2204	5041	207	69					gdh glucose-1-dehydrogenase Staphylococcus xylosus gdtA, gdh genes.
Contig359D	4486693_f2_49	2205	5042	804	268	976	2.30E-98	Staphylococcus xylosus	e324856	YbbH Bacillus subtilis DNA for FeuB, FeuA, YbbB, YbbC, YbbD, YbzA, YbbE, YbbF, YbbH, YbbI, YbbJ, YbbK, YbbL, YbbM, YbbP, complete cds.
Contig359D	4491450_f2_65	2206	5043	873	291	306	2.30E-27	Bacillus subtilis	d1020262	UREF UreF S. xylosus (C2a) UreF and UreG genes.
Contig359D	4547163_f1_19	2207	5044	699	233	741	1.90E-73	Staphylococcus xylosus	P42876	
Contig359D	4569012_f1_35	2208	5045	588	196					
Contig359D	4720928_f1_4	2209	5046	186	62					
Contig359D	4800202_c1_129	2210	5047	621	207	384	1.30E-35	Helicobacter pylori	g1800188	ORF37H. pylori chromosomal fragment ~38.5kb, complete sequence. ORF37 - similar to H. influenzae HttC - S72674; E.

Contig359D	4804153_f1_14	2211	5048	690	230	439	1.90E-41	Bacillus subtilis	e1182575	ydiGmolybdopterin precursor biosynthesis homolog ydiGBacillus subtilis complete genome (section 4 of 21) similar to molybdopterin precursor biosynthesis
Contig359D	4876675_f2_57	2212	5049	399	133	430	1.70E-40	Staphylococcus xylosus	P42875	ureAurease gamma subunitS.xylosus gene for ureA, ureB, and ureC genes for urease gamma, beta and alpha subunits. urease 11K chain
Contig359D	4884662_c3_171	2213	5050	1128	376	293	5.50E-26	Acinetobacter calcoaceticus	g2271503	unknownAcinetobacter calcoaceticus ADP1 vanillate demethylase region, vanillate demethylase (vanB) and vanillate demethylase (vanA) genes, complete cds. similar to salicylate hydroxylase; ORF7
Contig359D	4976687_c1_137	2214	5051	924	308	192	1.60E-13	Methanobacterium thermoautotrophicum	g2622492	MTH1382 conserved proteinMethanobacterium thermoautotrophicum from bases 1243964 to 1257931 (section 107 of 148) of the complete genome. Function Code
Contig359D	5087556_c2_156	2215	5052	849	283	499	8.20E-48	Bacillus subtilis	e1185017	moeBmolybdopterin biosynthesis proteinBacillus subtilis complete genome (section 8 of 21)
Contig359D	5113550_f2_64	2216	5053	1089	363	240	9.90E-19	Borrelia burgdorferi	g2689897	BBB07 outer surface protein, putativeBorrelia burgdorferi plasmid cp26, complete plasmid sequence. similar to GB
Contig359D	5266018_f2_71	2217	5054	771	257	415	6.50E-39	Bacillus subtilis	P54717	yfiAunknownBacillus subtilis complete genome (section 5 of 21) similar to hypothetical proteins
Contig359D	5898328_f2_48	2218	5055	864	288	1102	1.00E-111	Staphylococcus xylosus	e324855	glcAglucose uptake proteinStaphylococcus xylosus gltA, gdh genes.
Contig359D	6929676_c1_121	2219	5056	342	114					
Contig359D	7031318_f2_67	2220	5057	339	113					
Contig359D	7086677_c3_170	2221	5058	243	81					
Contig359D	818812_c2_157	2222	5059	1287	429	1034	1.70E-104	Bacillus subtilis	e1185018	moeAmolybdopterin biosynthesis proteinBacillus subtilis complete genome (section 8 of 21)

Contig359D	829761_c1_140	2223	5060	2172	724	1751	1.70E-180	Bacillus subtilis	d1020016	topBPBROBABLE DNA TOPOISOMERASE III Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.
Contig359D	959427_f1_25	2224	5061	417	139	241	1.80E-20	Staphylococcus carneus	g2735506	seeBSeeB precursor Staphylococcus carneus N5,N10- methylentetrahydrodromethanopterinreducta se homolog, SeeB precursor (seeB) and putative transmembrane protein genes, complete cds, and putative Na <sup>+</sup> /H <sup>+</sup> antiporter NhaC(nhaC) gene, partial cds, major secreted pro
Contig359D	964077_c1_133	2225	5062	453	151	443	7.00E-42	Bacillus subtilis	e1185020	moaEmolybdopterin converting factor (subunit 2) Bacillus subtilis complete genome (section 8 of 21)
Contig359D	975061_c3_173	2226	5063	1455	485	916	5.30E-92	Haemophilus influenzae	Q57007	H11107Na <sup>+</sup> /H <sup>+</sup> antiporter (nhaC) Haemophilus influenzae from bases 1163012 to 1173282 (section 105 of 163) of the complete genome, similar to GB
Contig359D	9928500_c1_130	2227	5064	261	87	229	3.30E-19	Bacillus subtilis	e1185017	moeBmolybdopterin biosynthesis protein Bacillus subtilis complete genome (section 8 of 21)
Contig359D	9977318_f1_33	2228	5065	1437	479	700	4.10E-69	Escherichia coli	d1017042	IPA-49DPTS SYSTEM, SUCROSE- SPECIFIC IIBC COMPONENTE. coli genomic DNA, Kohara clone #419(54.7- 55.1 min.), similar to [SwissProt Accession Number P05306
Contig360D	10463_f3_80	2229	5066	504	168	315	2.60E-28	Bacillus subtilis	P40779	ytXGYtxGBacillus subtilis rrmB-dnaB genomic region. ORF1
Contig360D	1056693_f2_45	2230	5067	1101	367	774	5.90E-77	Bacillus subtilis	g2293210	ytoPYtoPBacillus subtilis rrmB-dnaB genomic region, similar to hypothetical protein f356 from E. coli
Contig360D	116337_c1_90	2231	5068	627	209	199	5.00E-16	Lactococcus lactis	g3043872	transmembrane protein Tmp3 Lactococcus lactis transmembrane protein Tmp3 gene, partial cds. PBPIA homolog; identified as a fusion to a signal

Contig360D	1203827_f2_34	2232	5069	639	213	475	2.80E-45	Acinobacillus pleuropneumoniae	P50854	ribBriboflavin synthase alpha subunit Actinobacillus pleuropneumoniae riboflavin biosynthesis operon, riboflavin-specific deaminase (ribG), riboflavin synthase alphasubunit (ribB), bifunctional GTP cyclohydrolase II/3, 4-dihydroxy-2-butanone-4-phosphate synthase
Contig360D	1284381_f3_62	2233	5070	741	247	297	2.10E-26	Methanococcus jannaschii	g1591624	MJ0960transaldolase Methanococcus jannaschii section 81 of 150 of the complete genome. Bacillus subtilis 23K phosphoprotein orfU similar to SP
Contig360D	13787912_f2_32	2234	5071	1524	508	118	1.40E-05	Escherichia coli	g1787957	hypothetical protein b1668 Escherichia coli K-12 MG1655 section 152 of 400 of the complete genome. o534; This 534 aa ORF is 38 pct identical (6 gaps)
Contig360D	13852187_c2_161	2235	5072	186	62	113	3.70E-06	Bacteriophage phi-13	g758229	integrategrase Bacteriophage phi-13 integrase gene.
Contig360D	14251933_c1_87	2236	5073	663	221	818	1.30E-81	Bacillus subtilis	g2293319	rpsD ribosomal protein S4 Bacillus subtilis rrmB-dnaB genomic region. Escherichia coli ribosomal protein S4
Contig360D	14742937_f1_7	2237	5074	231	77					
Contig360D	14882928_f1_16	2238	5075	1098	366	1279	1.80E-130	Staphylococcus xylosum	e220317	aroA chorismate mutase S. xylosum aroA, ccpA, acuC and acuA genes.
Contig360D	14894807_c3_190	2239	5076	228	76					
Contig360D	163151_f2_28	2240	5077	1248	416	1800	1.10E-185	Staphylococcus aureus	P50307	S-adenosylmethionine synthetase Staphylococcus aureus S-adenosylmethionine synthetase gene, complete cds. SAM synthetase
Contig360D	16586012_c3_186	2241	5078	588	196	456	2.90E-43	Bacillus subtilis	g2293301	ytqBYtqB Bacillus subtilis rrmB-dnaB genomic region.
Contig360D	16994043_f1_20	2242	5079	1128	376					
Contig360D	191713_f2_39	2243	5080	11091	3697	562	3.80E-49	Homo sapiens	g405715	giantin H. sapiens giantin mRNA. giantina new 376kD Golgi complex outer membrane protein
Contig360D	19565876_f3_76	2244	5081	201	67					
Contig360D	19645900_c3_181	2245	5082	357	119	135	5.70E-09	mitochondrion Leishmania tarentolae	C30010	hypothetical ORF-6 protein



Contig360D	19742842_f1_4	2246	5083	849	283	776	3.60E-77	Bacillus subtilis	e1249784	yvgNputative reductase protein, YvgNBacillus subtilis 42.7kB DNA fragment from yvsA to yvqA.alternate gene name
Contig360D	1991325_c3_171	2247	5084	219	73					
Contig360D	1992943_c1_136	2248	5085	747	249	104	1.90E-05	Plasmodium yoelii	g160225	CSPcircumsporozoite protein( CSP) yoelii circumsporozoite protein (CSP) gene, 5' end.precursor
Contig360D	20834812_c3_194	2249	5086	306	102					
Contig360D	2117077_c1_124	2250	5087	366	122	195	1.30E-15	Aquifex aeolicus	g2983116	aq_449hypothetical proteinAquifex aeolicus section 22 of 109 of the complete genome.
Contig360D	2126250_c3_185	2251	5088	210	70					
Contig360D	21522010_c3_193	2252	5089	1725	575	2393	1.60E-248	Staphylococcus aureus	P51065	pckaphosphoenolpyruvate carboxykinaseStaphylococcus aureus phosphoenolpyruvate carboxykinase (pckA)gene, complete cds.PEPCCK; homologue
Contig360D	22078331_c1_138	2253	5090	252	84					
Contig360D	22391432_c1_137	2254	5091	525	175	288	1.90E-25	Bacteriophage phi-13	g758229	intintegraseBacteriophage phi-13 integrase gene.
Contig360D	22459692_c2_157	2255	5092	201	67					
Contig360D	23601713_f2_35	2256	5093	1194	398	1108	2.40E-112	Bacillus amyloliquefaciens	P51695	ribA3, 4-dihydroxy-2-butanone 4-phosphate synthaseB. amyloliquefaciens ribB, ribG, ribA, ribH & ribT genes.GTP cyclohydrolase II
Contig360D	2383253_f3_55	2257	5094	198	66					
Contig360D	23984787_f1_17	2258	5095	1011	337	1404	1.00E-143	Staphylococcus xylosus	e220318	ccpAS.xylosus aroA, ccpA, acuC and acuA genes.
Contig360D	24020250_f3_63	2259	5096	882	294	551	5.40E-52	Staphylococcus saprophyticus	e1295630	aasAAS surface proteinStaphylococcus saprophyticus aas gene.
Contig360D	24226543_f2_52	2260	5097	783	261	365	1.30E-33	Bacillus subtilis	e1182963	yhdWHypothetical proteinBacillus subtilis complete genome (section 6 of 21)similar to glycerophosphodiester phosphodiesterase

Contig360D	24296925_c1_122	2261	5098	552	184	127	5.70E-08	Clostridium botulinum	e184374	P-21C.botulinum progenitor toxin complex genes.
Contig360D	24334563_f1_11	2262	5099	453	151	109	2.00E-05	Pyrococcus horikoshii	d1027404	PHBM041279aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 216006-259128 nt position, clones similar to PIR
Contig360D	24337750_f3_74	2263	5100	852	284	1238	4.00E-126	Staphylococcus haemolyticus	P54694	daD-amino acid transaminaseStaphylococcus haemolyticus Y176 D-amino acid transaminase (dat)gene, complete cds.
Contig360D	24417252_f2_37	2264	5101	1248	416	1036	1.00E-104	Bacillus subtilis	g2293179	ytBYtB Bacillus subtilis rrmB-dnaB genomic region.similarity to tetracycline resistance protein from
Contig360D	24609676_f1_6	2265	5102	471	157					
Contig360D	24692338_f2_36	2266	5103	474	158	540	3.70E-52	Bacillus amyloliquefacie ns	Q44681	ribHlumazine synthase (b-subunit)B.amyloliquefaciens ribB, ribG, ribA, ribH & ribT genes.
Contig360D	24720291_c3_189	2267	5104	498	166					
Contig360D	24740701_f2_38	2268	5105	2508	836	3293	0	Bacillus subtilis	g2293181	leuSleucine tRNA synthetaseBacillus subtilis rrmB-dnaB genomic region.
Contig360D	24797177_f2_46	2269	5106	3534	1178	1450	1.40E-148	Bacillus subtilis	g2293215	ypTYtpTBacillus subtilis rrmB-dnaB genomic region.strong similarity to FtsK of E. coli and SpoIIIE of
Contig360D	24853437_f3_65	2270	5107	831	277	423	9.20E-40	Bacillus subtilis	g2293167	ypTAprobable lysophospholipaseBacillus subtilis rrmB-dnaB genomic region.similar to lysophospholipase
Contig360D	2548537_f2_51	2271	5108	222	74					
Contig360D	25665878_f3_72	2272	5109	1665	555	1014	2.20E-102	Bacillus subtilis	g2293198	ytgPYtpBacillus subtilis rrmB-dnaB genomic region.similar to SpoVB protein from B. subtilis
Contig360D	26175952_c1_121	2273	5110	258	86					
Contig360D	26259686_c2_141	2274	5111	1242	414	801	8.10E-80	Bacillus subtilis	e1181491	ykdaYkdABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.putative serine protease, heat-shock inducible;
Contig360D	26567062_f3_58	2275	5112	792	264	428	2.70E-40	Bacillus subtilis	g2293162	ytmAputative peptidaseBacillus subtilis rrmB-dnaB genomic region.

Contig360D	26596062_c1_101	2276	5113	1284	428	1198	6.90E-122	Bacillus subtilis	g2293312	ytjPYtPBacillus subtilis rmB-dnaB genomic region.similarity to hypothetical protein f400 from E.
Contig360D	2757633_f1_3	2277	5114	1494	498	1275	1.60E-164	Staphylococcus aureus	Q53634	meneo-succinylbenzoic acid (OSB) CoA ligaseStaphylococcus aureus o-succinylbenzoic acid CoA ligase (mene),and o-succinylbenzoic acid synthetase (menc) genes, complete cds.
Contig360D	281531_c3_180	2278	5115	372	124	94	6.70E-05	Kinetoplast Trypanosoma brucei	g501027	Trypanosoma brucei EATRO 164 kinetoplast (CR4) mRNA, complete cds. ORF2
Contig360D	2923202_f2_50	2279	5116	1473	491	1202	2.60E-122	Vibrio furnissii	g1732197	nagEPTS permease for N-acetylglucosamine andVibrio furnissii PTS permease for N-acetylglucosamine and glucose(nagE) gene, complete cds.PTS enzyme IINag
Contig360D	29562552_c1_131	2280	5117	276	92	281	1.00E-24	Bacillus subtilis	g2293294	ytjAYtjABacillus subtilis rmB-dnaB genomic region.similarity to hypothetical 9.3 kD protein from P.
Contig360D	30079651_c3_164	2281	5118	1620	540	1135	3.30E-115	Bacillus subtilis	g1146196	serAphosphoglycerate dehydrogenaseBacillus subtilis phosphoglycerate dehydrogenase (serA), ypaA,ferredoxin (fer), ypbB, recS, ypbD, ypbE, ypbF, ypbG, ypbH,glutamate dehydrogenase (ypcA), ypdA, ypdB, ypdC, spore cortexlytic enzyme (sleB), ypeB, ypfA, ypfB,
Contig360D	30084402_c2_140	2282	5119	1188	396	716	8.30E-71	Synechococcus sp.	P14776	soluble hydrogenase, small chainSynecococcus DNA for the small subunit of soluble hydrogenase.serine--pyruvate aminotransferasesmall subunit of soluble hydrogenase (AA 1-384)
Contig360D	30274187_c1_115	2283	5120	969	323	1317	1.70E-134	Bacillus subtilis	g2293302	ytqAYtqABacillus subtilis rmB-dnaB genomic region.similarity to biotine synthase from B.sphaericus
Contig360D	31256568_f3_86	2284	5121	201	67	114	5.10E-07	Pyrococcus horikoshii	d1024740	PHAA016119aa long hypothetical proteinPyrococcus horikoshii OT3 PHAA001-PHAA055 genes, complete cds.

Contig360D	3158502_f2_44	2285	5122	225	75	122	2.20E-07	Bacillus subtilis	g2293206	ytmPYtmPBacillus subtilis rmb-dnaB genomic region.
Contig360D	33287515_c2_156	2286	5123	330	110					
Contig360D	33360312_c3_168	2287	5124	420	140	295	1.30E-25	Streptococcus pneumoniae	e1284114	pbp1b penicillin-binding protein
Contig360D	33630311_f3_73	2288	5125	1341	447	1001	5.20E-101	Bacillus stearothermophilus	g436965	partial, beta-lactamase-resistant. hypothetical protein 1Bacillus stearothermophilus maltose permease (malA) gene, complete cds.
Contig360D	3365887_f2_43	2289	5126	630	210	501	5.00E-48	Bacillus subtilis	g2293206	ytmPYtmPBacillus subtilis rmb-dnaB genomic region.
Contig360D	34178128_f2_30	2290	5127	216	72					
Contig360D	34199077_f2_25	2291	5128	1017	339	864	1.70E-86	Staphylococcus aureus	g1255260	menco-succinylbenzoic acid (OSB) synthetaseStaphylococcus aureus o-succinylbenzoic acid CoA ligase (mene), and o-succinylbenzoic acid synthetase (mene) genes, complete cds.
Contig360D	34415925_f3_75	2292	5129	654	218	540	3.70E-52	Bacillus subtilis	g2293207	ytmQYtmQBacillus subtilis rmb-dnaB genomic region. similar to hypothetical protein HI0340 from H.
Contig360D	34429838_f2_26	2293	5130	483	161	261	1.40E-22	Bacillus subtilis	g2293161	ytkDYtkDBacillus subtilis rmb-dnaB genomic region.
Contig360D	34610925_c2_139	2294	5131	462	154	274	5.70E-24	Bacillus subtilis	e1183387	ymaD conserved hypothetical protein ymaDBacillus subtilis complete genome (section 10 of 21) similar to hypothetical proteins
Contig360D	4110882_c3_172	2295	5132	351	117					
Contig360D	4183428_f1_15	2296	5133	1329	443	1966	2.90E-203	Staphylococcus aureus	g2642659	murCUUDP-N-acetylmuramoyl-L-alanine synthetaseStaphylococcus aureus UDP-N-acetylmuramoyl-L-alanine synthetase(murC) gene, complete cds. MurC; UDP-N-acetylmuramate-alanine ligase
Contig360D	4296950_f1_2	2297	5134	198	66					
Contig360D	4299175_f3_56	2298	5135	240	80					
Contig360D	4502308_f3_83	2299	5136	636	212	502	3.90E-48	Bacillus subtilis	e1182955	yhdO hypothetical proteinBacillus subtilis complete genome (section 6 of 21) similar to 1-acylglycerol-3-phosphate

Contig360D	4697318_f3_77	2300	5137	867	289	671	4.80E-66	Bacillus subtilis	g2293212	ypqYtpQBacillus subtilis rrmB-dnaB genomic region.
Contig360D	4776702_f3_67	2301	5138	312	104	164	2.60E-12	Bacillus subtilis	P54433	yrkFYrkFBacillus subtilis DNA, 283 Kb region containing skin element.similar to hypothetical proteins from B. subtilis
Contig360D	4876300_f3_81	2302	5139	1695	565	1839	8.20E-190	Streptococcus mutans	Q59925	ftsformyl-tetrahydrofolate synthetaseStreptococcus mutans formyl-tetrahydrofolate synthetase (fts) gene, complete cds.formyl-tetrahydrofolate ligase; ATP-dependant
Contig360D	5081252_c3_191	2303	5140	360	120	199	5.00E-16	Aquifex aeolicus	g2983116	aq_449hypothetical proteinAquifex aeolicus section 22 of 109 of the complete genome.
Contig360D	5355250_f2_49	2304	5141	1284	428	1343	3.00E-137	BACILLUS STEAROTHERMOPHILUS	P00952	TYRSyrosine--tRNA ligase,TYROSYL-TRNA SYNTHETASE, (TYROSINE--TRNA LIGASE) (TYRRS)tyrosine--tRNA ligase
Contig360D	551907_c1_134	2305	5142	708	236	183	2.50E-14	Streptococcus thermophilus bacteriophage TP-J34	g2897104	putative host cell surface-exposed lipoproteinStreptococcus thermophilus bacteriophage lysogeny module, integrasehomolog (int), putative host cell surface-exposed lipoprotein,putative metallo-proteinase, repressor, Cro-like regulatoryprotein, and P1-antir
Contig360D	572186_f2_47	2306	5143	1284	428	190	2.00E-11	Petromyzon marinus	g632549	NF-180Petromyzon marinus neurofilament subunit NF-180 mRNA, complete cds.180 kDa neurofilament subunit
Contig360D	5911592_f2_29	2307	5144	924	308					
Contig360D	6070392_f2_42	2308	5145	708	236	415	6.50E-39	Haemophilus influenzae	P45124	H11243hypotheticalHaemophilus influenzae from bases 1311704 to 1324184 (section 119of 163) of the complete genome.similar to SP
Contig360D	6100150_f2_23	2309	5146	189	63					
Contig360D	6317_f1_13	2310	5147	411	137	267	3.10E-23	Bacillus subtilis	g2293211	ypPputative thioredoxinBacillus subtilis rrmB-dnaB genomic region.similar to thioredoxin H1

Contig360D	785952_f1_14	2311	5148	567	189	552	2.00E-53	Bacillus subtilis	g2293213	ytpRYtpRBacillus subtilis rrmB-dnaB genomic region.similarity to phenylalanine tRNA ligase of E. coli
Contig360D	82562_c1_116	2312	5149	1110	370	680	5.40E-67	Bacillus subtilis	e1182272	ycgMproline oxidase homolog ycgMBacillus subtilis complete genome (section 2 of 21)similar to proline oxidase
Contig360D	954768_f2_33	2313	5150	1053	351	611	1.10E-59	Bacillus subtilis	P17618	ribGriboflavin-specific deaminaseBacillus subtilis spoVA to serA region.ribG protein product (AA 1-361)
Contig360D	960012_f3_66	2314	5151	450	150	109	1.70E-06	Bacillus firmus	g2654484	hypothetical 16.1 kDa transcriptional regulatorBacillus firmus hypothetical 34.0 kDa protein, hypothetical 8.9 kDa protein, hypothetical 10.1 kDa protein, hypothetical 21.0 kDa protein, putative thiosulfate sulfurtransferase, hypothetical 16.1kDa transcript
Contig360D	9845327_f3_60	2315	5152	192	64			Staphylococcus aureus	P49994	dnaADnaAStaphylococcus aureus DNA for DnaA, complete cds.
Contig361D	11739752_c3_51	2316	5153	915	305	1172	3.90E-119	Helicobacter pylori	g2314496	HP1331 conserved hypothetical integral membraneHelicobacter pylori section 112 of 134 of the complete genome.similar to EGAD
Contig361D	157500_c1_43	2317	5154	729	243	253	9.50E-22	Staphylococcus schleiferi	g3044072	hlb beta-hemolysinStaphylococcus schleiferi beta-hemolysin (hlb) gene, partial cds.
Contig361D	21660805_f1_8	2318	5155	1017	339	867	8.20E-87	Staphylococcus aureus	P95689	serSseryl-tRNA synthetaseS.aureus serS gene.
Contig361D	22902302_c1_41	2319	5156	1407	469	2010	6.20E-208	Staphylococcus aureus	d1001842	gyrADNA gyrase AStaphylococcus aureus genes for DNA gyrase A and B, complete cds.
Contig361D	23507_c1_40	2320	5157	2709	903	3998	0	Staphylococcus aureus	P49994	dnaADnaAStaphylococcus aureus DNA for DnaA, complete cds.
Contig361D	23704502_f1_14	2321	5158	267	89			Staphylococcus aureus	g143421	ribosomal protein L9ribosomal protein L9B.steartotherophilus ribosomal protein L9 gene, complete cds.
Contig361D	24023300_c2_46	2322	5159	516	172	760	1.80E-75	Bacillus stearothermophilus		
Contig361D	24645817_c2_50	2323	5160	453	151	461	8.70E-44			

Contig361D	24817142_c1_39	2324	5161	1947	649	3147	0	Staphylococcus aureus	P20832	gyrBDNA gyraseS.aureus genes gyrB, gyrA and recF (partial).DNA topoisomerase (ATP-hydrolyzing) chain B
Contig361D	270890_c3_53	2325	5162	186	62					
Contig361D	2931557_c3_52	2326	5163	1119	373	1692	3.10E-174	STAPHYLOCOCCUS AUREUS	P29232	RECfRecF proteinRECf PROTEINRecf protein
Contig361D	33244187_c3_57	2327	5164	1989	663	1592	1.20E-163	Bacillus subtilis	P37484	yybTunknownB. subtilis DNA, 180 kilobase region of replication origin.
Contig361D	34004590_f3_31	2328	5165	291	97					
Contig361D	34266582_c2_47	2329	5166	1158	386	1796	3.00E-185	STAPHYLOCOCCUS AUREUS	P50029	DNANDNA-directed DNA polymerase, III beta chainDNA POLYMERASE III, BETA CHAIN,DNA-directed DNA polymerase III beta chain
Contig361D	35324092_c1_44	2330	5167	987	329	219	8.20E-28	Saccharomyces cerevisiae	P08465	MET2homoserine O-acetyltransferase, S.cerevisiae chromosome XIV reading frame ORF YNL277w.homoserine acetyltransferaseORF YNL277w
Contig361D	35369052_c1_45	2331	5168	1404	468	1252	1.30E-127	Bacillus subtilis	P37469	dnaCreplative DNA helicaseB. subtilis DNA, 180 kilobase region of replication origin.
Contig361D	36359761_f3_36	2332	5169	840	280	581	1.70E-56	Streptococcus thermophilus	P96051	Streptococcus thermophilus tetrahydrofolatedehydrogenase/cyclohydro lase (folD), penicillin-binding protein 2b(pbp2b) and DNA repair and recombination protein (recM) genes,complete cds.orf1091
Contig361D	41265_c3_58	2333	5170	1365	455	1593	9.60E-164	Bacillus subtilis	d1005716	purAadenylosuccinate synthetaseB. subtilis DNA, 180 kilobase region of replication origin.adenylosuccinate synthase
Contig361D	4179680_c2_49	2334	5171	936	312	214	1.50E-16	Bacillus subtilis	P37485	yybSunknownB. subtilis DNA, 180 kilobase region of replication origin.
Contig361D	5190938_c3_56	2335	5172	471	157					
Contig361D	6054512_f3_35	2336	5173	207	69					
Contig361D	7031563_c1_38	2337	5174	243	81	358	7.10E-33	Staphylococcus aureus	S54709	hypothetical protein 81

Contig362D	10195942_c1_98	2338	5175	636	212	253	9.50E-22	Thermotoga maritima	Q56320	trpFphosphoribosyl anthranilate isomeraseT.maritima trpD, trpC, trpF, trpB, and trpA genes.trpF homology
Contig362D	10667002_f1_14	2339	5176	189	63					
Contig362D	11844802_c3_157	2340	5177	327	109					
Contig362D	13087513_c2_112	2341	5178	3033	1011	547	1.30E-49	Aquifex aeolicus	g2983515	aq_1006hypothetical protein/Aquifex aeolicus section 50 of 109 of the complete genome.
Contig362D	1360958_c2_110	2342	5179	270	90	109	1.70E-06	Bacillus subtilis	e249647	yneJYneJB.subtilis DNA (26.2 kb fragment; 170 degree region).identical to yoxI (from acc. no. X87845)
Contig362D	13678462_f3_61	2343	5180	564	188	303	4.80E-27	Synechococcus sp.	P39665	sphXSphXSynechococcus sp. sphX gene for phosphate regulon SphX, completecds.
Contig362D	13845300_f1_1	2344	5181	309	103			Staphylococcus carneus	e1181777	glcTanti terminatorStaphylococcus carneus glcT gene.
Contig362D	13875216_c1_95	2345	5182	1023	341	895	8.90E-90	Bacillus subtilis	e249654	yneRYneRB.subtilis DNA (26.2 kb fragment; 170 degree region).
Contig362D	14251643_f3_79	2346	5183	309	103	143	4.30E-10	BACILLUS STEAROTHER MOPHILUS	P23375	RPMGribosomal protein L3350S RIBOSOMAL PROTEIN L33Escherichia coli ribosomal protein L33
Contig362D	14471938_c3_131	2347	5184	183	61	231	2.00E-19	Archaeoglobus fulgidus	g2649218	AF1357phosphate ABC transporter, permease protein.Archaeoglobus fulgidus section 97 of 172 of the complete genome.similar to SP
Contig362D	1461588_f3_62	2348	5185	942	314	712	2.20E-70	Bacillus subtilis	P45708	yneFYneFB.subtilis DNA (26.2 kb fragment; 170 degree region).identical to yoxG (from acc. no. X87845)
Contig362D	14723387_c2_109	2349	5186	282	94	250	2.00E-21	Bacillus subtilis	P46342	yqgKYqgKBacillus subtilis DNA, 283 Kb region containing skin element.Similarity to phosphate transport protein (PstB) of
Contig362D	14850082_f3_64	2350	5187	933	311	880	3.40E-88	Enterococcus hirae	g1147744	PSREnterococcus hirae psr gene, complete cds.
Contig362D	14876553_c3_146	2351	5188	996	332	570	2.40E-55	Bacillus subtilis	e249647	yneJYneJB.subtilis DNA (26.2 kb fragment; 170 degree region).identical to yoxI (from acc. no. X87845)
Contig362D	15084826_c3_136	2352	5189	300	100	268	2.50E-23			



Contig362D	15757712_f3_68	2353	5190	732	244	358	7.10E-33	Aquifex aeolicus	g2984331	abcT11ABC transporterAquifex aeolicus section 106 of 109 of the complete genome.
Contig362D	157875_c3_137	2354	5191	390	130					
Contig362D	16205378_c2_123	2355	5192	243	81					
Contig362D	16835388_f3_65	2356	5193	654	218	265	5.10E-23	Enterobacter cloacae	d1023735	phoUnegative regulatory protein of pho regulonEnterobacter cloacae pstS, pstC, pstA, pstB and phoU genes,complete cds. The phoU gene is required for chemotaxis to ward
Contig362D	19540678_c1_91	2357	5194	438	146	241	9.90E-20	Bacillus subtilis	P54417	opuDputative transporterBacillus subtilis rrnB-dnaB genomic region.alternate gene name
Contig362D	19730438_c3_151	2358	5195	1272	424	2221	2.70E-230	Staphylococcus epidermidis	g1815620	femBFEMBSStaphylococcus epidermidis factor essential for methicillinresistance FEMB (femB) gene, complete cds. Factor essential for methicillin resistance
Contig362D	20312510_f2_38	2359	5196	1041	347	290	1.50E-48	Escherichia coli	d1015860	Dipeptide transport system permease proteinE.coli genomic DNA, Kohara clone #278(33.3-33.7 min.) ORF ID
Contig362D	20400051_f2_56	2360	5197	810	270	691	3.70E-68	Bacillus subtilis	P31080	lexAtranscriptional regulatorBacillus subtilis lexA gene, 3' end.alternate gene name
Contig362D	20501250_c3_148	2361	5198	1029	343	551	2.50E-53	Methanococcus jannaschii	Q57686	MJ0234anthranilate synthase component II (trpD)Methanococcus jannaschii section 21 of 150 of the complete genome.trpD homologysimilar to GB
Contig362D	21641877_f1_4	2362	5199	954	318	687	9.80E-68	Archaeoglobus fulgidus	g2649217	AF1358phosphate ABC transporter, permease proteinArchaeoglobus fulgidus section 97 of 172 of the complete genome.similar to GB
Contig362D	22663932_f3_67	2363	5200	972	324	450	1.30E-42	Bacillus firmus	g1813497	dppCDipeptide transporter protein dppCBacillus firmus dppABC operon, dipeptide transporter protein dppA gene, partial cds, and dipeptide transporter proteins dppB and dppCgenes, complete cds.

Contig362D	23491077_c2_129	2364	5201	1266	422	1031	3.40E-104	Bacillus subtilis	g410117	lysAdiaminopimelate decarboxylaseBacillus subtilis spoVA to serA region.
Contig362D	23650343_c3_159	2365	5202	1167	389	527	8.80E-51	Pyrococcus horikoshii	d1028137	PHAJ010387aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 922700-958423 nt position(complementary strand), clonesimilar to Swiss Prot
Contig362D	23671890_c2_117	2366	5203	1287	429	918	3.20E-92	Bacillus subtilis	e1183597	uvrXUV-damage repair proteinBacillus subtilis complete genome (section 12 of 21)alternate gene name
Contig362D	23673150_c3_133	2367	5204	1002	334	1329	9.10E-136	Bacillus subtilis	e1184292	yumDunknownBacillus subtilis complete genome (section 17 of 21)similar to GMP reductase
Contig362D	23860952_f2_44	2368	5205	516	172	460	1.10E-43	Bacillus subtilis	P54154	yppPDNA-binding proteinBacillus subtilis (YAC10-9 clone) DNA region between the serA andkgd loci.42.4% identity with the Lycopersicon esculentum
Contig362D	23944052_c1_86	2369	5206	378	126	248	1.40E-20	Bacteroides fragilis	P45737	katBcatalaseBacteroides fragilis catalase (katB) gene, complete cds.catalase
Contig362D	24225053_c3_134	2370	5207	318	106	202	2.40E-16	Bacillus subtilis	e1183447	ynzChypothetical protein ynzCBacillus subtilis complete genome (section 10 of 21)
Contig362D	24251466_c1_92	2371	5208	2745	915	3437	0	Bacillus subtilis	e249650	citBaconitaseB.subtilis DNA (26.2 kb fragment; 170 degree region).
Contig362D	24267942_c2_128	2372	5209	1089	363	300	1.00E-26	Bacillus subtilis	d1020054	alrALANINE RACEMASEBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.alternate gene name
Contig362D	24640925_c3_138	2373	5210	1272	424	1288	2.00E-131	Bacillus subtilis	P54417	opuDputative transporterBacillus subtilis rrnB-dnaB genomic region.alternate gene name
Contig362D	24647176_c3_152	2374	5211	771	257	120	3.10E-05	Bacillus subtilis	g1377832	ykrAunknownBacillus subtilis ampS-nprE gene region.similar in C-terminus to partial sequence of orf1
Contig362D	24647182_c2_126	2375	5212	729	243	347	1.00E-31	Aquifex aeolicus	g2983426	dapBdihydrodipicolinate reductaseAquifex aeolicus section 45 of 109 of the complete genome.

Contig362D	24666043_c2_115	2376	5213	1233	411	866	1.10E-86	Bacillus subtilis	e1185989	yubA conserved hypothetical protein yubABacillus subtilis complete genome (section 16 of 21) similar to hypothetical proteins
Contig362D	24744010_c3_132	2377	5214	273	91	347	1.00E-31	Bacillus subtilis	e1182877	yhzA ribosomal protein S14 homolog yhzABacillus subtilis complete genome (section 5 of 21) similar to ribosomal protein S14
Contig362D	24823377_f2_35	2378	5215	912	304	462	6.80E-44	Bacillus subtilis	e1183105	yitL hypothetical protein yitL Bacillus subtilis complete genome (section 6 of 21)
Contig362D	25445253_c3_139	2379	5216	495	165	336	1.50E-30	Bacillus subtilis	e249652	yneP YnePB subtilis DNA (26.2 kb fragment; 170 degree region), similar to hypothetical proteins
Contig362D	25664512_c3_144	2380	5217	495	165	279	1.70E-24	Bacillus subtilis	e1182832	yfiW YfiW Bacillus subtilis complete genome (section 5 of 21)
Contig362D	25977318_c1_94	2381	5218	2415	805	3470	0	Staphylococcus aureus	d1011747	griADNA topoisomerase IV GrlA subunit Staphylococcus aureus DNA for DNA topoisomerase IV GrlB subunit, DNA topoisomerase IV GrlA subunit, complete cds.
Contig362D	26210925_c3_135	2382	5219	2028	676	2097	3.80E-217	Bacillus subtilis	P45694	tktA transketolase B subtilis DNA (26.2 kb fragment; 170 degree region). alternate gene name
Contig362D	26213890_c3_130	2383	5220	699	233	757	3.70E-75	Streptomyces coelicolor	e313391	catA catalase S coelicolor catA gene.
Contig362D	26354837_c3_158	2384	5221	900	300	570	2.40E-55	Methanococcus jannaschii	Q57695	MJ0244 dihydrodipicolinate synthase (dapA) Methanococcus jannaschii section 22 of 150 of the complete genome. similar to GB
Contig362D	2931337_f1_6	2385	5222	780	260	352	3.10E-32	Pyrococcus horikoshii	d1027923	PHCH023 oligopeptide transport ATP- binding protein APPD Pyrococcus horikoshii OT3 genomic DNA, 695940- 732858 nt position, clone contains ABC transporters family signature ;
Contig362D	32812_c3_145	2386	5223	204	68					
Contig362D	35187587_c1_97	2387	5224	588	196	370	3.80E-34	Thermotoga maritima	S34747	anthranilate synthase, component II glutamine amidotransferase

Contig362D	35557787_c1_105	2388	5225	1275	425	787	2.50E-78	Bacillus subtilis	P08495	LYSCaspartinase II alpha subunitBacillus subtilis thioedoxin (trx), uvrB and aspartokinase II genes, complete cds.aspartate kinase homology.
Contig362D	36142827_c2_122	2389	5226	1812	604	780	1.40E-77	Bacillus licheniformis	d1014255	Pz-peptidaseBacillus licheniformis DNA for Pz-peptidase, complete cds.
Contig362D	36523462_c2_113	2390	5227	900	300	1439	2.00E-147	Staphylococcus aureus	d1011744	grlBDNA topoisomerase IV GrIB subunitStaphylococcus aureus DNA for DNA topoisomerase IV GrIB subunit,DNA topoisomerase IV GrIA subunit, complete cds.
Contig362D	3928177_f1_5	2391	5228	360	120					
Contig362D	3937551_c2_125	2392	5229	999	333	803	5.00E-80	Aquifex aeolicus	g2984139	asdAspartate-semialdehyde dehydrogenaseAquifex aeolicus section 92 of 109 of the complete genome.
Contig362D	3961702_c2_120	2393	5230	1269	423	2249	2.90E-233	Staphylococcus epidermidis	JCS325	femAmethicillin resistance factor FEMA
Contig362D	4025303_c3_149	2394	5231	792	264	450	1.30E-42	Lactococcus lactis	Q01999	trpCindoleglycerol phosphate synthaseL. lactis trpE, trpG, trpD, trpF, trpC, trpB trpA genes, completecds.indole-3-glycerol-phosphate synthase
Contig362D	4062762_f3_82	2395	5232	405	135	508	9.10E-49	Staphylococcus aureus	g3135292	mscLlarge conductance mechanosensitive channelStaphylococcus aureus large conductance mechanosensitive channel(mscL) gene, complete cds.MscL
Contig362D	4063802_c2_118	2396	5233	1497	499	808	1.50E-80	Lactococcus lactis	Q02001	trpEanthranilate synthase alpha subunitL. lactis trpE, trpG, trpD, trpF, trpC, trpB trpA genes, completecds.anthranilate synthase component I
Contig362D	4089062_c2_111	2397	5234	1176	392	319	9.70E-29	Aquifex aeolicus	g2984155	sbcDATP-dependent dsDNA exonucleaseAquifex aeolicus section 93 of 109 of the complete genome.
Contig362D	4798453_c1_87	2398	5235	1026	342	242	2.70E-27	Bacillus subtilis	e334771	yjbCYIbC proteinBacillus subtilis genomic DNA 23.9kB fragment similar to hypothetical proteins from B. subtilis

Contig362D	4884675_c1_99	2399	5236	1212	404	1268	2.60E-129	Lactococcus lactis	Q01998	trpBtryptophan synthase beta subunitL. lactis trpE, trpG, trpD, trpF, trpC, trpB trpA genes, complete cds. tryptophan synthase beta chain
Contig362D	4890802_f1_12	2400	5237	1152	384	819	1.00E-81	Bacillus subtilis	g143815	tyrATyrAB.subtilis dbpA, mtr(A,B), gerC(1-3), ndk, cheR, aro(B,E,F,H), trp(A- F), hisH, and tyrA genes, complete cds.
Contig362D	4964686_f2_42	2401	5238	204	68	195	1.30E-15	Bacillus subtilis	e267624	ywhBUnknown, highly similar to Pseudomonas putidaB.subtilis thrZ downstream chromosomal region. similar to 4-oxalocrotonate tautomerase
Contig362D	5109378_f3_78	2402	5239	615	205	469	1.20E-44	Bacillus subtilis	e249655	yneSYneSB.subtilis DNA (26.2 kb fragment; 170 degree region). similar to hypothetical protein MG247 from
Contig362D	5120635_c2_108	2403	5240	240	80					
Contig362D	6258588_c2_114	2404	5241	1470	490	1305	3.20E-133	Bacillus subtilis	Q45068	alsTAlsTB.subtilis DNA (26.2 kb fragment; 170 degree region). similar to sodium/proton dependent alanine carrier
Contig362D	6416566_c1_93	2405	5242	1155	385	1755	6.50E-181	Staphylococcus aureus	P50072	grlBDNA topoisomerase IV GrlB subunitStaphylococcus aureus DNA for DNA topoisomerase IV GrlB subunit, DNA topoisomerase IV GrlA subunit, complete cds. DNA topoisomerase (ATP-hydrolyzing) chain Bunnamed protein product
Contig362D	6664127_c3_156	2406	5243	438	146					
Contig362D	6818827_c1_104	2407	5244	1608	536	2088	3.40E-216	Bacillus subtilis	c1185033	ykpAABC transporter (ATP-binding protein) homolog ykpABacillus subtilis complete genome (section 8 of 21) similar to ABC transporter (ATP-binding protein)
Contig362D	6929652_c2_127	2408	5245	744	248	683	2.60E-67	Bacillus subtilis	e1181922	ykuQYkuQ proteinBacillus subtilis 29kB DNA fragment from ykwC gene to cse15 gene. homologous to acetyltransferases

Contig362D	7203176_c2_119	2409	5246	801	267	426	4.40E-40	Methanococcus jannaschii	Q60180	MJ1038tryptophan synthase alpha subunit (trpA)Methanococcus jannaschii section 88 of 150 of the complete genome. tryptophan synthase alpha chain homologysimilar to GB
Contig362D	7242250_c3_150	2410	5247	681	227	276	3.50E-24	Saccharomyces cerevisiae	g927800	YDR533CYdr533cpSaccharomyces cerevisiae chromosome IV cosnids 8166, 9787, 9717, and lambda 3073. similar to Schizosaccharomyces pombe hypothetical
Contig362D	837550_c3_143	2411	5248	246	82					
Contig362D	970306_c2_106	2412	5249	642	214	776	3.60E-77	Vibrio fischeri	g3064126	katA catalase Vibrio fischeri catalase (katA) gene, complete cds.
Contig362D	978450_c2_116	2413	5250	2049	683	965	3.40E-97	Bacillus subtilis	d1025380	YfiX Bacillus subtilis DNA, genome sequence, 79 to 81 degree region.
Contig362D	9798180_c1_89	2414	5251	204	68					
Contig362D	9814213_f2_36	2415	5252	471	157	232	1.60E-19	Archaeoglobus fulgidus	g2649219	AF1356phosphate ABC transporter, periplasmic Archaeoglobus fulgidus section 97 of 172 of the complete genome. similar to PID
Contig363D	10667002_c2_258	2416	5253	207	69					
Contig363D	10734838_c3_307	2417	5254	996	332	397	5.30E-37	Saccharomyces cerevisiae	P32377	ERG19diphosphomevalonate decarboxylase S. cerevisiae ERG19 gene. ORF YNR043w
Contig363D	10735832_c1_220	2418	5255	273	91					
Contig363D	11032762_f3_148	2419	5256	327	109	160	6.80E-12	Bacteriophage SPP1	e244469	Bacteriophage SPP1 complete nucleotide sequence. gene 2.1
Contig363D	117893_c3_318	2420	5257	426	142					
Contig363D	1227250_f2_111	2421	5258	996	332	562	1.70E-54	Bacillus subtilis	P54948	yxel penicillin amidase homolog yxel Bacillus subtilis complete genome (section 21 of 21) similar to penicillin amidase
Contig363D	12714833_c2_286	2422	5259	1218	406					

Contig363D	12902217_f1_41	2423	5260	681	227	292	7.00E-26	Bacillus subtilis	g3169323	yojGYojGBacillus subtilis'YojA (yojA), YojB (yojB), YojC (yojC), YojD(yojD), YojE (yojE), YojF (yojF), YojG (yojG), YojH (yojH), YojI(yojI), YojJ (yojJ), YojK (yojK), YojL (yojL), YojM (yojM), YojN(yojN), and YojO (yojO) genes, complete cds; and OdhA (odh
Contig363D	134702_f3_164	2424	5261	834	278	673	3.00E-66	Bacillus subtilis	P39610	ipa-52rphosphomethylpyrimidine kinaseB.subtilis genomic region (325 to 333).alternate gene name
Contig363D	13835930_c3_313	2425	5262	276	92					
Contig363D	13876005_c2_250	2426	5263	339	113					
Contig363D	14547143_c1_195	2427	5264	522	174	501	5.00E-48	Bacillus subtilis	P21335	yaaIunknownB. subtilis DNA, 180 kilobase region of replication origin. ORF17 (AA 1-161)
Contig363D	14587817_f2_101	2428	5265	528	176					
Contig363D	14647510_f1_7	2429	5266	255	85					
Contig363D	14879688_c2_261	2430	5267	927	309	234	4.20E-26	Pyrococcus horikoshii	d1028731	PHLE008335aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1434542-1450104 nt position, clone contains GHMP kinases putative ATP-binding domain;
Contig363D	14882681_c1_216	2431	5268	210	70	99	2.00E-05	Streptococcus thermophilus bacteriophage TP-J34	g2897106	repressorStreptococcus thermophilus bacteriophage lysogeny module, integrasehomolog (int), putative host cell surface-exposed lipoprotein.putative metallo-proteinase, repressor, Cro-like regulatoryprotein, and P1-antirepressor homolog genes, complete cds.
Contig363D	14885260_c2_269	2432	5269	441	147	209	4.40E-17	Streptococcus thermophilus	g2444132	ORF25Streptococcus thermophilus bacteriophage 01205 DNA sequence.putative small subunit of the terminase
Contig363D	15735181_f3_134	2433	5270	204	68					

Contig363D	15782160_c2_245	2434	5271	747	249	469	1.20E-44	Caenorhabditis elegans	g1458327	F08F3.4Caenorhabditis elegans cosmid F08F3.
Contig363D	16054827_c3_320	2435	5272	357	119					
Contig363D	16212803_c2_274	2436	5273	318	106	124	4.50E-08	Bacteriophage SPP1	e244843	15gene 15 proteinBacteriophage SPP1 complete nucleotide sequence.gene 15
Contig363D	16413130_f3_170	2437	5274	246	82	135	2.00E-08	Saccharomyces cerevisiae	P32583	SRP40SRP40 proteinS.cerevisiae DNA of chromosome XI, right arm.ORF YKR412
Contig363D	16603427_c2_284	2438	5275	531	177					
Contig363D	16798777_c3_291	2439	5276	3558	1186	5906	0	Staphylococcus aureus	P47768	rpoBDNA-directed RNA polymerase beta chainS.aureus rplL, orf202, rpoB(rif) and rpoC genes for ribosomalprotein L7/L12, hypothetical protein ORF202, DNA-directed RNA polymerase beta & beta' chains.DNA-directed RNA polymerase beta chain
Contig363D	19690876_c1_208	2440	5277	876	292	662	4.40E-65	Bacillus subtilis	P39648	ipa-90dhypothetical proteinB.subtilis genomic region (325 to 333).alternate gene name
Contig363D	19695386_c3_315	2441	5278	771	257					
Contig363D	20078287_f2_108	2442	5279	825	275	145	2.10E-07	Mycobacterium tuberculosis	e1264597	MTV025.085putative membrane proteinMycobacterium tuberculosis sequence v025.MTV025.085, len
Contig363D	20087752_f1_44	2443	5280	1506	502	397	2.10E-36	Bacillus subtilis	P13484	tagEUDP-glucoseBacillus subtilis rodC operon.rodD (gtaA) polypeptide (AA 1-673)
Contig363D	20322153_c3_306	2444	5281	219	73					
Contig363D	20331552_c3_296	2445	5282	996	332	447	2.60E-42	Methanobacterium thermoautotrophicum	g2622612	MTH1495ornithine cyclodeaminaseMethanobacterium thermoautotrophicum from bases 1349621 to 1362200(section 116 of 148) of the complete genome.Function Code



Contig363D	20511590_c2_240	2446	5283	384	128	414	8.30E-39	MICROCOC US LUTEUS	P02395	RPLr ribosomal protein L7/L1250S RIBOSOMAL PROTEIN L7/L12 (MA1/MA2) Escherichia coli ribosomal protein L12
Contig363D	20756260_c1_225	2447	5284	408	136					
Contig363D	2131552_f3_132	2448	5285	378	126	118	1.10E-06	Plasmodium fophurae	P04929	histidine-rich protein Plasmodium gene fragment for histidine-rich protein. plasmodium histidine-rich protein
Contig363D	21484465_c2_278	2449	5286	516	172					
Contig363D	21598838_f2_109	2450	5287	465	155	155	6.00E-11	Haemophilus influenzae	P44520	H10108 hypothetical Haemophilus influenzae from bases 111654 to 122227 (section 11 of 163) of the complete genome. similar to GB
Contig363D	21758468_c3_340	2451	5288	489	163	123	5.70E-08	Aquifex aeolicus	g2983204	rimI ribosomal-protein-alanine acetyltransferase Aquifex aeolicus section 28 of 109 of the complete genome.
Contig363D	22069160_c3_294	2452	5289	393	131	623	5.90E-61	Staphylococcus aureus	P48942	rpsL ribosomal protein S12 Staphylococcus aureus ribosomal protein S12 (rpsL) gene, completeds, ribosomal protein S7 (rpsG) and ORF 1 genes, partial cds.
Contig363D	22272200_c1_229	2453	5290	939	313					
Contig363D	22400261_c2_273	2454	5291	834	278	634	4.00E-62	Bacteriophage B1	e139438	mhp major head protein Bacteriophage TP901-1 genomic region.
Contig363D	22694377_c1_185	2455	5292	741	247	762	1.10E-75	Staphylococcus aureus	g677850	ORF202 hypothetical protein S. aureus rplL, orf202, rpoB(rif) and rpoC genes for ribosomal protein L7/L12, hypothetical protein ORF202, DNA-directed RNA polymerase beta & beta' chains.
Contig363D	22773302_c1_232	2456	5293	1803	601	1371	3.20E-140	Staphylococcus phage 187	e286568	ply187 cell wall hydrolase Ply187 Staphylococcus phage 187 ply187 and hol187 genes.
Contig363D	22790941_c2_277	2457	5294	543	181	143	4.30E-10	Bacteriophage SPP1	e244714	Bacteriophage SPP1 complete nucleotide sequence. gene 17.1

Contig363D	23442135_c2_253	2458	5295	675	225	148	1.80E-09	Synechocystis sp.	d1018298	cbbZpphosphoglycolate phosphatase Synechocystis sp. PCC6803 complete genome, 9/27, 1056467-118885. ORF_ID
Contig363D	23469213_c2_268	2459	5296	411	137					
Contig363D	23477213_c2_260	2460	5297	1011	337	1085	6.50E-110	Bacillus subtilis	P39646	ipa-88dphosphotransacylaseB.subtilis genomic region (325 to 333).alternate gene name
Contig363D	23572178_c3_319	2461	5298	195	65					
Contig363D	23601637_c1_193	2462	5299	816	272	374	1.40E-34	Haemophilus influenzae	g471234	CDP-ribitol pyrophosphorylase H.influenzae DNA for serotype b capsulation locus.orf1
Contig363D	23603391_c3_328	2463	5300	294	98					
Contig363D	23617140_c2_254	2464	5301	1404	468	441	5.00E-44	Bacillus subtilis	e1183038	yhfThypotheical protein Bacillus subtilis complete genome (section 6 of 21) similar to long-chain fatty-acid-CoA ligase
Contig363D	23712830_c1_213	2465	5302	489	163	225	8.80E-19	Streptococcus thermophilus bacteriophage Sf121	g2352435	Streptococcus thermophilus bacteriophage Sf121 DNA replication module.orf157
Contig363D	23867125_f1_36	2466	5303	204	68					
Contig363D	2392837_c1_226	2467	5304	426	142	226	6.90E-19	Bacteriophage SPP1	e244844	Bacteriophage SPP1 complete nucleotide sequence.gene 16.1
Contig363D	23992128_c2_282	2468	5305	222	74	114	5.10E-07	Staphylococcus phage 187	e286569	hol187holin protein Hol187Staphylococcus phage 187 ply 187 and hol187 genes.
Contig363D	24026077_c3_326	2469	5306	954	318	560	2.80E-54	Bacteriophage SPP1	e244838	7gene 7 proteinBacteriophage SPP1 complete nucleotide sequence.gene 7
Contig363D	24229837_c1_215	2470	5307	243	81	97	3.20E-05	Lactobacillus sake	g599850	orf1hypothetical protein (bacteriocin saiA 3'-region)L.sake sakacin A gene cluster.
Contig363D	24258462_c3_335	2471	5308	336	112	200	3.90E-16	Lactococcus lactis phage BK5-T	g928831	Bacteriophage BK5-T ORF410, 3' end pf cds, 20 ORFs, repressor protein, and Cro repressor protein genes, complete cds, ORF70'gene, 5' end of cds.ORF95; putative

Contig363D	24650468_f2_103	2485	5322	1383	461	489	9.40E-47	Bacteriophage TP901-1	el55312	integraseBacteriophage TP901-1 ORF1,2 & 3.Orf1
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Contig363D	24667192_fl_42	2486	5323	183	61	201	1.40E-15	Plasmid p1258	P30329	arsB arsenic efflux pump protein p1258 arsenic resistance operon (arsRBC) genes, complete cds. arsenical pump membrane protein
Contig363D	24803462_fl_4	2487	5324	861	287	463	5.30E-44	Synechocystis sp.	P73846	SLR1717 hypothetical protein Synechocystis sp. PCC6803 complete genome, 12/27, 1430419-1576592. ORF_ID
Contig363D	24823437_f2_102	2488	5325	495	165					
Contig363D	24854637_c3_300	2489	5326	903	301	404	9.50E-38	Bacillus subtilis	e1184491	ywtE conserved hypothetical protein ywtE Bacillus subtilis complete genome (section 19 of 21) similar to hypothetical proteins
Contig363D	25438433_f2_81	2490	5327	420	140					
Contig363D	25509692_c3_331	2491	5328	498	166	151	6.10E-11	Bacteriophage SPP1	e244846	Bacteriophage SPP1 complete nucleotide sequence, gene 17.5
Contig363D	25578827_c2_242	2492	5329	261	87	334	2.50E-30	Staphylococcus aureus	Q53602	unknown Staphylococcus aureus ribosomal protein S12 (rpsL) gene, complete cds, ribosomal protein S7 (rpsG) and ORF 1 genes, partial cds. ORF 1
Contig363D	25579662_fl_52	2493	5330	1221	407	849	6.60E-85	Bacillus subtilis	e1183009	yhaA aminoacylase homolog yhaA Bacillus subtilis complete genome (section 6 of 21) similar to aminoacylase
Contig363D	25660937_c3_339	2494	5331	498	166	175	2.90E-13	Bacillus subtilis	P46922	opuA C-glycine betaine-binding protein precursor Bacillus subtilis ATPase (opuAA), transmembrane protein (opuAB) and glycine betaine-binding protein precursor (opuAC) genes, complete cds.
Contig363D	26173287_c3_329	2495	5332	363	121	103	7.50E-06	Bacteriophage SPP1	e244712	Bacteriophage SPP1 complete nucleotide sequence, gene 16
Contig363D	26290912_f2_114	2496	5333	882	294	665	2.10E-65	Bacillus subtilis	e1182286	yciA conserved hypothetical protein yciA Bacillus subtilis complete genome (section 2 of 21) similar to hypothetical proteins
Contig363D	26306568_c1_221	2497	5334	330	110					

Contig363D	26350125_c2_265	2498	5335	252	84	164	3.10E-22	Homo sapiens	P33316	DUTdeoxyuridine nucleotidohydrolaseHuman deoxyuridine nucleotidohydrolase mRNA, complete cds.retroviral proteinaseDUT-N; alternatively spliced; nuclear form of the
Contig363D	26360327_c1_222	2499	5336	552	184					
Contig363D	26369082_c2_267	2500	5337	252	84					
Contig363D	26375952_c1_214	2501	5338	627	209	223	1.40E-18	Bacteriophage TP901-1	e1254413	hypothetical proteinBacteriophage TP901-1 ORFs 1-12. ORF11
Contig363D	26569377_c3_304	2502	5339	639	213	625	3.60E-61	Bacillus subtilis	e1182298	ycjGD-arabino 3-hexulose 6-phosphate formaldeh homolog yckGBacillus subtilis complete genome (section 2 of 21)similar to D-arabino 3-hexulose 6-phosphate
Contig363D	26734625_f3_156	2503	5340	351	117	210	3.40E-17	Streptococcus thermophilus bacteriophage Sfi21	e308969	orf127cI-like repressorStreptococcus thermophilus bacteriophage Sfi21 DNA; lysogenymodule, 8141 bp.putative
Contig363D	26772801_f3_157	2504	5341	504	168	127	2.30E-09	Dictyostelium discoideum	g467292	glutamine-asparagine rich proteinDictyostelium discoideum AX3 glutamine-asparagine rich proteingene, partial cds.
Contig363D	26839638_c1_236	2505	5342	1314	438	1429	2.30E-146	Bacillus subtilis	P39651	ywfOUknownBacillus subtilis complete genome (section 20 of 21)alternate gene name
Contig363D	27318_c2_290	2506	5343	1035	345	1198	6.90E-122	Zymomonas mobilis	P20368	ADHAalcohol dehydrogenase, 1Z.mobilis alcohol dehydrogenase 1 (adhA) gene, complete cds.alcohol dehydrogenasealcohol dehydrogenase I (adhA) (EC 1.1.1.1)
Contig363D	276590_c3_309	2507	5344	375	125	279	1.70E-24	Bacillus subtilis	e1186261	yvwzChypothetical protein yvwzCBacillus subtilis complete genome (section 20 of 21)
Contig363D	2847887_f1_43	2508	5345	576	192	797	2.20E-79	Plasmid p1258	P30329	arsBarsenic efflux pump proteinPlasmid p1258 arsenic resistance operon (arsRBC) genes, completecds.arsenical pump membrane protein

Contig363D	29694425_f3_172	2509	5346	852	284	418	3.10E-39	Bacillus subtilis	P51831	fabG3-ketoacyl-acyl carrier protein reductaseBacillus subtilis PlsX (plsX), malonyl-CoAalso called 3-oxoacyl-acyl carrier protein
Contig363D	2995675_f2_60	2510	5347	252	84					
Contig363D	30742332_c2_271	2511	5348	228	76					
Contig363D	31334838_c3_341	2512	5349	519	173	544	1.40E-52	Bacillus subtilis	e267625	ywhDUnknownB.subtilis thrZ downstream chromosomal region.
Contig363D	31353377_c1_188	2513	5350	474	158	699	5.20E-69	Bacillus subtilis	e1182044	rpsGribosomal protein S7 (BS7)Bacillus subtilis complete genome (section 1 of 21)
Contig363D	32031437_c1_230	2514	5351	2706	902	1163	3.50E-118	Bacteriophage PZA	P07537	12pre-neck appendage proteinBacteriophage PZA (from B.subtilis), complete genome.phage PZA gene 12 protein
Contig363D	32595152_c1_231	2515	5352	402	134					
Contig363D	3306563_c2_256	2516	5353	366	122					
Contig363D	33235050_f2_70	2517	5354	507	169					
Contig363D	33414693_c3_308	2518	5355	1089	363	150	5.80E-16	Methanococcus jannaschii	Q58487	MJ1087mevalonate kinaseMethanococcus jannaschii section 93 of 150 of the complete genome.similar to PID
Contig363D	33600035_c3_295	2519	5356	2118	706	2785	4.70E-290	Bacillus subtilis	e1182045	fuselongsation factor GBacillus subtilis complete genome (section 1 of 21)
Contig363D	33756503_c3_311	2520	5357	210	70	125	3.50E-08	Lactobacillus casei bacteriophage A2	e1285113	orfBhypothetical proteinBacteriophage A2 rep, xis and int genes.
Contig363D	33786251_c2_287	2521	5358	246	82					
Contig363D	33869193_c1_223	2522	5359	183	61	130	1.00E-08	Staphylococcus bacteriophage phi 11	Q03183	rinBBacteriophage phi-11 int gene activatorBacteriophage phi-11 rinA and rin B genes, required for theactivation of Staphylococcal phage phi-11 int expression.
Contig363D	34025066_c2_281	2523	5360	642	214	89	6.90E-07	Bacteriophage phig1e	e247172	Rorf232Lactobacillus bacteriophage phig1e complete genomic DNA.
Contig363D	34242202_c3_317	2524	5361	270	90					

1002411 030603

Contig363D	4329063_c2_243	2540	5377	1245	415	1759	2.50E-181	Bacillus subtilis	P33166	tufA elongation factor TuBacillus subtilis complete genome (section 1 of 21) translation elongation factor Tu
Contig363D	4398453_f1_49	2541	5378	477	159	279	3.70E-24	Chelatobacter heintzii	P54989	nmoA NTA monooxygenase component AChelatobacter heintzii NTA monooxygenase component B (nmoB), NTA monooxygenase component A (nmoA), regulatory protein (nmoR) and transposase (nmoT) genes, complete cds.
Contig363D	446062_c1_235	2542	5379	690	230	1165	2.20E-118	Staphylococcus aureus	P19380	putative transposase S. aureus IS431 mec gene associated with methicillin resistance, putative transposase (AA 1-224)
Contig363D	4725006_c3_334	2543	5380	537	179					
Contig363D	4727203_c1_204	2544	5381	369	123					
Contig363D	4735833_f1_46	2545	5382	711	237	464	4.20E-44	Bacillus subtilis	P37530	yaaG unknown B. subtilis DNA, 180 kilobase region of replication origin, similar to deoxypurine kinase subunit
Contig363D	4741068_c3_327	2546	5383	609	203	210	3.40E-17	Bacteriophage phig1e	e247154	Rorf204 minor capsid protein Lactobacillus bacteriophage phig1e complete genomic DNA.
Contig363D	4741077_c3_314	2547	5384	687	229	238	3.70E-20	Bacteriophage phig1e	e247139	Rorf242 Lactobacillus bacteriophage phig1e complete genomic DNA.
Contig363D	4875756_f2_89	2548	5385	201	67					
Contig363D	4876967_c1_196	2549	5386	579	193	168	9.70E-13	Bacillus subtilis	e1182923	yhdA hypothetical protein Bacillus subtilis complete genome (section 5 of 21) similar to hypothetical proteins
Contig363D	4882760_c3_345	2550	5387	183	61					
Contig363D	4886075_f2_118	2551	5388	678	226	794	4.50E-79	Bacillus subtilis	P37529	yaaF unknown B. subtilis DNA, 180 kilobase region of replication origin, similar to deoxypurine kinase subunit
Contig363D	4892127_c1_233	2552	5389	2706	902	1557	6.30E-160	Bacillus subtilis	d1020130	ydfJ antibiotic transport-associated protein homolog ydfJ Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. PROBABLE TRANSPORT PROTEIN, SIMILAR TO ANTIBIOTIC



	Contig363D	4901703_c1_191	2553	5390	510	170						Saccharomyces cerevisiae	e253285		probable membrane protein YDL246cS.cerevisiae chromosome IV reading frame ORF YDL246c.alcohol dehydrogenaseORF YDL246c
	Contig363D	4946962_c2_247	2554	5391	1068	356	172	1.60E-10				Bacillus subtilis	P37455		sbsingle strand DNA binding proteinB. subtilis DNA, 180 kilobase region of replication origin.single-stranded DNA-binding protein homology
	Contig363D	4964677_c2_263	2555	5392	444	148	126	2.30E-15				Bacillus subtilis	P37455		ybtTglucosamine-6-phosphate isomerase homolog ybfTBacillus subtilis complete genome (section 2 of 21)similar to glucosamine-6-phosphate isomerase
	Contig363D	5080092_c3_303	2556	5393	744	248	529	5.40E-51				Bacillus subtilis	e1182188		ipa-87conserved hypothetical protein ywflB.subtilis genomic region (325 to 333).alternate gene name
	Contig363D	5125076_f2_107	2557	5394	810	270	873	1.90E-87				Bacillus subtilis	P39645		SPP1 gene 2terminaseBacteriophage SPP1 complete nucleotide sequence.gene 2
	Contig363D	5251588_c1_234	2558	5395	582	194						Bacteriophage SPP1	P54308		AF0049A.fulgidus predicted coding region AF0049Archaeoglobus fulgidus section 4 of 172 of the complete genome.hypothetical protein; identified by GeneMark;
	Contig363D	5258515_c3_325	2559	5396	1314	438	1298	1.80E-132				Archaeoglobus fulgidus	g2650605		
	Contig363D	5370450_f3_127	2560	5397	1284	428	305	2.90E-27							
	Contig363D	56626_c2_280	2561	5398	336	112									
	Contig363D	587811_f3_168	2562	5399	345	115									
	Contig363D	6056625_c1_238	2563	5400	258	86									
	Contig363D	6406337_f3_133	2564	5401	210	70									
	Contig363D	6407136_c2_270	2565	5402	1455	485	667	1.30E-65				Bacteriophage SPP1	P54309		SPP1 gene 6portal proteinBacteriophage SPP1 complete nucleotide sequence.gene 6
	Contig363D	6757338_c2_246	2566	5403	1089	363	1129	1.40E-114				Bacillus subtilis	e1182191		ybgEBranched-chain amino acid aminotransferase homolog ybgEBacillus subtilis complete genome (section 2 of 21)similar to branched-chain amino acid

Contig363D	6932750_f1_40	2567	5404	378	126	266	4.00E-23	Bacillus subtilis	g3169322	yofYyofBacillus subtilis YojA (yofA), YojB (yofB), YojC (yofC), YojD(yofD), YojE (yofE), YojF (yofF), YojG (yofG), YojH (yofH), YojI(yofI), YojJ (yofJ), YojK (yofK), YojL (yofL), YojM (yofM), YojN(yofN), and YojO (yofO) genes, complete cds; and OdhA (odh
Contig363D	7068751_c3_336	2568	5405	945	315	974	3.80E-98	Bacillus subtilis	P46336	iolSmyo-inositol catabolism iolSBacillus subtilis genomic DNA, 36 kb region between gnt and ioloperons, plausibly involved in inositol catabolism
Contig363D	7275263_c1_227	2569	5406	441	147	158	1.10E-11	Bacteriophage SPP1	e244713	Bacteriophage SPP1 complete nucleotide sequence, gene 17
Contig363D	818942_c3_338	2570	5407	477	159	173	2.80E-17	Bacillus subtilis	P46922	opuACglycine betaine-binding protein precursorBacillus subtilis ATPase (opuAA), transmembrane protein (opuAB) and glycine betaine-binding protein precursor (opuAC) genes, complete cds.
Contig363D	819575_c2_279	2571	5408	1857	619	158	1.20E-08	Bacteriophage phig1e	e247163	Rorf372Lactobacillus bacteriophage phig1e complete genomic DNA.
Contig363D	821012_c3_298	2572	5409	1725	575	469	5.70E-44	Haemophilus influenzae	g547513	hypothetical protein 3 (capsulation locus)Haemophilus influenzae serotype a capsulation locus region II DNA.orf3
Contig363D	833125_f3_149	2573	5410	285	95					
Contig363D	892842_c1_205	2574	5411	387	129	337	1.20E-30	Bacillus subtilis	P39619	ipa-61 dconserved hypothetical protein ywdKB. subtilis genomic region (325 to 333). alternate gene name
Contig363D	9765677_c3_312	2575	5412	804	268	226	6.90E-19	Lactococcus lactis phage BK5-T	g928839	Bacteriophage BK5-T ORF'410, 3' end pf cds, 20 ORFs, repressor protein, and Cro repressor protein genes, complete cds, ORF70' gene, 5' end of cds. ORF266; putative
Contig363D	978377_c2_257	2576	5413	264	88					
Contig363D	9819392_c2_248	2577	5414	789	263	179	5.60E-13	Caenorhabditis elegans	g1463023	F45E1.3Caenorhabditis elegans cosmid F45E1.
Contig363D	9926903_c2_266	2578	5415	309	103					
Contig363D	994052_c3_333	2579	5416	1536	512					

HI1018 hypothetical Haemophilus influenzae from bases 111654 to 122227 (section 11 of 163) of the complete genome similar to GB

Contig364D	1214688_f2_104	2595	5432	939	313	526	1.10E-50	Bacillus subtilis	P18579	murBUDP-N-acetylpyruvoylglucosamine reductaseBacillus subtilis (clone lambda-BS1) cell division and sporulation protein (dds) gene, complete cds. ORF2
Contig364D	12595301_f2_108	2596	5433	258	86	95	7.00E-05	Pyrococcus horikoshii	d1027485	PHAY036173aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 299830-340636 nt position, clone contains prokaryotic membrane lipoprotein lipid
Contig364D	12616018_f3_159	2597	5434	270	90					
Contig364D	12617827_c3_469	2598	5435	762	254	856	1.20E-85	Bacillus subtilis	e1186080	tpitriose phosphate isomeraseBacillus subtilis complete genome (section 18 of 21)alternate gene name
Contig364D	12789077_c2_380	2599	5436	1107	369	1311	7.30E-134	Bacillus subtilis	g2618842	uvrAexcinuclease ABC subunit ABacillus subtilis 300-304 degree genomic sequence.
Contig364D	12948336_c2_384	2600	5437	273	91	316	2.00E-28	Bacillus subtilis	g2668494	clpPclpBacillus subtilis Clp protease proteolytic component (clpP) gene, complete cds. proteolytic component of Clp protease
Contig364D	1351533_c1_309	2601	5438	2571	857	3966	0	Staphylococcus aureus	O06446	secA SecA Staphylococcus aureus NCTC 8325 SecA (secA) gene, complete cds.
Contig364D	13710887_c1_322	2602	5439	753	251	315	2.60E-28	Acinetobacter sp. ADP1	g3172120	quiBcatabolic dehydroquinase dehydrataseAcinetobacter sp. ADP1 pca-qui-pob supraoperonic cluster, complete sequence.
Contig364D	13714193_c2_375	2603	5440	582	194	583	1.00E-56	STAPHYLOCOCCUS CARNOSUS	P47995	HYPOTHETICAL PROTEIN IN SECA 5'REGION (ORF1) (FRAGMENT)
Contig364D	13727318_f2_138	2604	5441	813	271	348	8.20E-32	Staphylococcus carnosus	g2735506	sceBScdB precursorStaphylococcus carnosus N5,N10-methylenetetrahydromethanopterinreductase homolog, SceB precursor (sceB) and putative transmembrane protein genes, complete cds, and putative Na+/H+ antiporter NhaC(nhaC) gene, partial cds. major secreted pro

	Contig364D	1376577_f3_170	2605	5442	675	225					Bacillus subtilis d1020071	ydcL integrase homolog ydcL Bacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree. PROBABLE INTEGRASE.
	Contig364D	13803167_f3_169	2606	5443	552	184	157	6.60E-11				pmpH phosphoglycerate mutase Bacillus subtilis complete genome (section 18 of 21)
	Contig364D	13921942_c2_387	2607	5444	1554	518	1690	5.10E-174			e1186079	
	Contig364D	13931527_c2_327	2608	5445	723	241						
	Contig364D	1408438_f2_147	2609	5446	948	316	110	6.80E-06			Escherichia coli g1787718	hypothetical protein b1447 Escherichia coli K-12 MG1655 section 131 of 400 of the complete genome.f149; This 149 aa ORF is 31 pct identical (11 gaps)
	Contig364D	14120465_f2_78	2610	5447	513	171						
	Contig364D	14460882_f1_33	2611	5448	183	61	128	5.00E-08			Staphylococcus haemolyticus g1022726	unknown Staphylococcus haemolyticus IS1272 ORF1 and ORF2 genes, completed cds. ORF1
	Contig364D	14478377_c2_349	2612	5449	1149	383	637	1.90E-62			P49852	ykiAYkiA Bacillus subtilis hmp DNA for 7 ORFs, complete cds.high homology to flavohemoprotein (Haemoglobin-like)
	Contig364D	14500052_f2_83	2613	5450	204	68						
	Contig364D	14564005_f3_198	2614	5451	249	83						
	Contig364D	14642203_c2_339	2615	5452	834	278	772	9.60E-77			e1186383	yxkDe conserved hypothetical protein yxkDB Bacillus subtilis complete genome (section 20 of 21) similar to hypothetical proteins
	Contig364D	14648452_c2_378	2616	5453	801	267	346	1.30E-31			e244971	S.aureus orfs 1,2,3 & 4. ORF1
	Contig364D	14875890_c2_361	2617	5454	846	282	713	1.70E-70			e1249784	yvgN putative reductase protein, YvgNB Bacillus subtilis 42.7kB DNA fragment from yvsA to yvqA.alternate gene name
	Contig364D	14878807_f3_255	2618	5455	960	320	162	2.40E-09			e321943	hypothetical protein E.faecalis plasmid DNA containing gene cluster involved in production and immunity to peptide antibiotic AS-48. ORF7
	Contig364D	14886052_c2_352	2619	5456	495	165	307	1.80E-27			P54486	yggCYgCB Bacillus subtilis DNA, 283 Kb region containing skin element.

Contig364D	15057762_c1_284	2620	5457	1575	525	1194	1.80E-121	Alcaligenes eutrophus	Q07252	putative membrane-bound protein with four times A. eutrophus genes for lactate dehydrogenase, putative membrane-bound protein with four times repetition of Pro- Ser-Ala at the N-terminus (function unknown) and transglycosidase (partial).
Contig364D	1561_c3_443	2621	5458	1944	648	1406	6.30E-144	Bacillus subtilis	e1182716	yfmR YfmR Bacillus subtilis complete genome (section 4 of 21) similar to ABC transporter (ATP-binding protein)
Contig364D	15661088_c1_268	2622	5459	513	171					
Contig364D	15751312_f2_111	2623	5460	2136	712	1980	9.40E-205	Entamoeba histolytica	Q24803	ADH2 alcohol dehydrogenase 2 Entamoeba histolytica HM1 The derived amino acid sequence of EhADH2 is
Contig364D	157767_c2_340	2624	5461	1077	359	227	1.20E-17	Rhodococcus sp.	g2088525	herheroin esterase Rhodococcus sp. heroin esterase (her) gene, complete cds. acetyl morphine carboxylesterase; Ser- 160 is the
Contig364D	15781336_c1_257	2625	5462	471	157	150	7.80E-11	Bacillus subtilis	e1186235	ywiB hypothetical protein ywiB Bacillus subtilis complete genome (section 20 of 21)
Contig364D	16595927_f3_251	2626	5463	213	71					
Contig364D	16603207_f1_13	2627	5464	378	126	217	6.20E-18	Mycobacterium leprae	g466873	B1496_F1_41 Mycobacterium leprae cosmid B1496.
Contig364D	166713_c1_311	2628	5465	2001	667	2697	9.90E-281	Bacillus subtilis	g2618841	uvrB excinuclease ABC subunit BBacillus subtilis 300-304 degree genomic sequence, alternate gene name
Contig364D	16834512_c2_355	2629	5466	1380	460	661	5.60E-65	Bacillus firmus	Q04449	phrDNA photolyase Bacillus firmus DNA photolyase (phr) gene, 3' end, and cytochrome oxidase (cta) operon, putative
Contig364D	16850303_c3_473	2630	5467	477	159	510	5.60E-49	Bacillus subtilis	e1186048	yval conserved hypothetical protein yval Bacillus subtilis complete genome (section 18 of 21) similar to hypothetical proteins

Contig364D	181500_c2_335	2631	5468	798	266	415	6.50E-39	Bacillus subtilis	P27620	tagA involved in polyglycerol phosphate teichoic acid biosynthesis tagA.B.subtilis tagA, tagB, tagC and tagD genes, complete cds, putative
Contig364D	187568_c1_264	2632	5469	327	109	178	8.50E-14	Bacillus subtilis	e1184242	yufC unknown Bacillus subtilis complete genome (section 17 of 21)
Contig364D	187916_c1_277	2633	5470	612	204	134	3.90E-09	Bacillus subtilis	g1750115	ynaDYnaDBacillus subtilis SpoVK (spoVK), YnbA (ynbA), YnbB (ynbB), GlnR (glnR), glutamine synthetase (glnA), YnaA (ynaA), YnaB (ynaB), YnaC (ynaC), YnaD (ynaD), YnaE (ynaE), YnaF (ynaF), YnaG (ynaG), YnaH (ynaH), YnaI (ynaI), YnaJ (ynaJ), xylan beta-1,4-xylo
Contig364D	19547783_f3_216	2634	5471	771	257	438	2.40E-41	Thermotoga maritima	g1575577	drdADNA-binding response regulator Thermotoga maritima DNA- binding response regulator (drdA) and histidine protein kinase (hpKA) genes, complete cds, thymidine/pyrimidine phosphorylase homolog gene, partial cds, complete cds, DrdA; OmpR/PhoB subfamily response
Contig364D	19589187_f1_4	2635	5472	207	69					
Contig364D	19696951_c2_390	2636	5473	183	61	193	2.20E-15	Bacillus subtilis	e1186051	yvaL hypothetical protein yvaL Bacillus subtilis complete genome (section 18 of 21)
Contig364D	19704062_f3_231	2637	5474	183	61					
Contig364D	197152_c2_330	2638	5475	348	116	247	4.10E-21	Bacillus sp.	d1007183	ORF3 Bacillus sp. Na+/H+ antiporter system responsible genes, Na+/H+ antiporter system responsible gene
Contig364D	19765965_c3_478	2639	5476	249	83	323	3.60E-29	Staphylococcus aureus	g2226349	cspCCspCStaphylococcus aureus CspC (cspC) gene, complete cds, similar to major cold-shock protein
Contig364D	19766886_f2_81	2640	5477	435	145	167	1.60E-12	Bacillus thuringiensis	e1294701	Bacillus thuringiensis plasmid pG12 with transposon Tn4430. ORF 2
Contig364D	20322153_c1_289	2641	5478	219	73					

Contig364D	20485663_f3_240	2642	5479	210	70								
Contig364D	20604832_f1_5	2643	5480	558	186								
Contig364D	20893828_c3_421	2644	5481	219	73								
Contig364D	20900017_c1_297	2645	5482	2169	723	2007	1.30E-207	Bacillus subtilis	P50620			nrdrENrdEB.subtilis cwIC, ndrE, ndrF, ymaA and ymaB genes.similarity to NrdE of Enterobacteriaceae	
Contig364D	209452_f2_145	2646	5483	648	216	754	7.80E-75	Staphylococcus epidermidis	e255528			membrane proteinS.epidermidis gene encoding ABC transport system.	
Contig364D	209627_c2_369	2647	5484	1032	344	830	6.90E-83	Bacillus subtilis	P50621			nrdrFNrdFB.subtilis cwIC, ndrE, ndrF, ymaA and ymaB genes.similarity to NrdF of Enterobacteriaceae	
Contig364D	2151937_c3_400	2648	5485	186	62								
Contig364D	21525061_c3_439	2649	5486	681	227	175	1.80E-13	Schizosaccharomyces pombe	e1251110			SPBC19G7.02hypothetical proteinS.pombe chromosome II cosmid c19G7.SPBC19G7.02, unknown, len	
Contig364D	21537811_c3_435	2650	5487	1137	379	925	5.90E-93	Bacillus subtilis	Q45539			csdBstress response proteinBacillus subtilis csbB gene, complete cds.similar to hypothetical protein from Synechocystis	
Contig364D	21897308_f3_233	2651	5488	261	87								
Contig364D	22265936_c2_372	2652	5489	1128	376	1557	6.30E-160	Staphylococcus aureus	d1005198			lilmpiliophilic protein which affects bacterial lysisStaphylococcus aureus gene for a participant in homogeneousexpression of high-level methicillin resistance, complete cds.	
Contig364D	22381590_f3_179	2653	5490	207	69								
Contig364D	22381693_c2_381	2654	5491	852	284	1187	1.00E-120	Staphylococcus aureus	P52282			Igtprolipoprotein diacylglyceryl transferaseStaphylococcus aureus prolipoprotein diacylglyceryl transferase(Igt) gene, complete cds.	
Contig364D	22391068_c3_454	2655	5492	1056	352	627	2.20E-61	Bacillus subtilis	e1182350			yclQferric anguibactin-binding protein precursor FatBBacillus subtilis complete genome (section 3 of 21)similar to ferrichrome ABC transporter (binding	



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Contig364D	23621010_c3_419	2669	5506	843	281	167	1.30E-10	Bacillus subtilis	d1020103	ydeCtranscriptional regulator (AraC/XylS family) homolog ydeCBacillus subtilis genome sequence, 148 kb sequence of the region between 35 and 47 degree.PROBABLE HTH_ARAC_FAMILY OF TRANSCRIPTIONAL
Contig364D	23631928_f3_225	2670	5507	228	76					
Contig364D	23634651_c3_417	2671	5508	1044	348	549	4.10E-53	Bacillus subtilis	g2293176	ysBsignal transduction protein kinaseBacillus subtilis rrmB-dnaB genomic region similar to two-component sensor histidine kinase
Contig364D	23672137_c1_282	2672	5509	957	319	260	5.40E-32	Synechocystis sp.	d1019609	47 kD proteinSynecocystis sp. PCC6803 complete genome, 27/27, 3418852-3573470. ORF ID
Contig364D	23703750_c3_476	2673	5510	639	213					
Contig364D	23844575_c1_316	2674	5511	1062	354	771	1.20E-76	Bacillus megaterium	P35168	hypothetical 37.7K proteinBacillus megaterium glyceraldehyde-3-phosphate dehydrogenase (gap), phosphoglycerate kinase (pgk), and triose phosphate isomerase (tpi) genes, complete cds.
Contig364D	2401430_c2_382	2675	5512	762	254	1076	5.90E-109	Staphylococcus aureus	e1256407	trxBthioredoxin reductaseStaphylococcus aureus trxB gene.
Contig364D	24218785_c1_317	2676	5513	1047	349	1258	3.00E-128	Clostridium acetobutylicum	g2829138	gapglyceraldehyde-3-phosphate dehydrogenaseClostridium acetobutylicum glyceraldehyde-3-phosphate dehydrogenase(gap), phosphoglycerate kinase (pgk), and triosephosphate isomerase(tpi) genes, complete cds; and 2,3-bpg-independent phosphoglyceratmutase (pgm)
Contig364D	24230001_f3_162	2677	5514	258	86					
Contig364D	24258388_c2_358	2678	5515	507	169					
Contig364D	24272125_c1_321	2679	5516	261	87					

Contig364D	24297000_f3_236	2680	5517	225	75								
Contig364D	24329053_c3_424	2681	5518	444	148	134	1.50E-08	Caenorhabditis elegans	g1825636	ZK354.3	Caenorhabditis elegans cosmid ZK354.		
Contig364D	24391937_c3_464	2682	5519	759	253								
Contig364D	24397952_c3_463	2683	5520	681	227	119	9.50E-05	Bacillus subtilis	e1186169	yvcD	hypothetical proteinBacillus subtilis complete genome (section 18 of 21)		
Contig364D	24406577_c2_362	2684	5521	390	130								
Contig364D	24407637_f2_79	2685	5522	243	81								
Contig364D	24429650_c2_360	2686	5523	1197	399	848	8.50E-85	Bacillus subtilis	g2618856	nagAN-acetylglucosamine 6-P deacetylaseBacillus subtilis 300-304 degree genomic sequence.			
Contig364D	24479842_c3_481	2687	5524	558	186	256	4.60E-22	Bacillus subtilis	e1182838	yfhCYfhCBacillus subtilis complete genome (section 5 of 21)similar to hypothetical proteins			
Contig364D	24506712_c1_298	2688	5525	975	325	692	2.90E-68	Bacillus subtilis	e1182348	yciO	homologue of ferric anguibactin transport systemBacillus subtilis complete genome (section 3 of 21)similar to ferrichrome ABC transporter (permease)		
Contig364D	24507932_c3_445	2689	5526	600	200	322	4.70E-29	Bacillus subtilis	e1185499	yorS	unknownBacillus subtilis complete genome (section 11 of 21)		
Contig364D	24640828_c1_262	2690	5527	516	172								
Contig364D	24642632_f1_31	2691	5528	1245	415	1245	7.20E-127	Bacillus subtilis	p55179	pepT	peptidase T (tripeptidase)B.subtilis orfs 1,2,3,4, pepT and galE genes.highly homologous to tripeptidases (peptidase T)		
Contig364D	24650427_f3_155	2692	5529	330	110	331	5.20E-30	Bacillus subtilis	d1020045	ydbP	thioredoxin homolog ydbPBacillus subtilis genome sequence, 148 kb sequence of the regionbetween 35 and 47 degree.PROBABLE THIOREDOXIN.		

Contig364D	24650462_c3_407	2693	5530	1515	505	848	8.50E-85	Bacillus subtilis	e1184241	yufDNADH dehydrogenase (ubiquinone) homolog yufDBacillus subtilis complete genome (section 17 of 21) similar to NADH dehydrogenase (ubiquinone)
Contig364D	24664840_c1_287	2694	5531	1968	656	1694	1.90E-174	Bacillus subtilis	e1185030	fruAphosphotransferase system (PTS)Bacillus subtilis complete genome (section 8 of 21)
Contig364D	24796927_f2_82	2695	5532	789	263	325	2.20E-29	Bacillus subtilis	e1183386	ymaCphage-related protein homolog ymaCBacillus subtilis complete genome (section 10 of 21) similar to phage-related protein
Contig364D	24803125_c3_431	2696	5533	978	326	982	5.40E-99	Bacillus israeli	Q59202	MDHmalate dehydrogenaseB.israeli DNA for malate dehydrogenase gene.
Contig364D	25401377_c3_453	2697	5534	852	284	698	6.70E-69	Bacillus subtilis	e1182349	yciPPhomologue of iron dicitrate transportBacillus subtilis complete genome (section 3 of 21) similar to ferrichrome ABC transporter (ATP-binding
Contig364D	25473782_c2_396	2698	5535	186	62					
Contig364D	25572180_c3_413	2699	5536	1272	424	895	8.90E-90	Bacillus subtilis	P42312	yxjApyrimidine nucleoside transport homolog yxjABacillus subtilis complete genome (section 20 of 21) similar to pyrimidine nucleoside transport
Contig364D	25585891_c1_291	2700	5537	1980	660	1949	1.80E-201	Bacillus subtilis	e1182705	yfnIYfnIBacillus subtilis complete genome (section 4 of 21) alternate gene name
Contig364D	25806300_f2_144	2701	5538	750	250	1270	1.60E-129	Staphylococcus epidermidis	e255626	ATP binding proteinS.epidermidis gene encoding ABC transport system.
Contig364D	26171927_c1_302	2702	5539	342	114	221	2.30E-18	Bacillus subtilis	P39914	yxjYyxjABacillus subtilis rmB-dnaB genomic region.alternate gene name
Contig364D	26176693_f3_210	2703	5540	828	276	685	1.60E-67	Methanobacterium thermoautotrophicum	g2621542	MTH473 conserved proteinMethanobacterium thermoautotrophicum from bases 404817 to 415582(section 37 of 148) of the complete genome.Function Code
Contig364D	2618827_c3_451	2704	5541	288	96					

Contig364D	26211552_c1_314	2705	5542	984	328	1034	1.70E-104	Bacillus subtilis	e1186163	yvcLhypothetical proteinBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins
Contig364D	26259638_f2_101	2706	5543	765	255	176	1.90E-11	Mycobacterium tuberculosis	e1264597	MTV025.085putative membrane proteinMycobacterium tuberculosis sequence v025.MTV025.085, len
Contig364D	26578577_c3_461	2707	5544	1791	597	2276	1.50E-238	Bacillus subtilis	g2618842	uvrAexcinuclease ABC subunit ABacillus subtilis 300-304 degree genomic sequence.
Contig364D	26735877_c2_399	2708	5545	402	134	446	3.40E-42	Bacillus subtilis	e1184358	yusHglycine cleavage system protein H homolog yusHBacillus subtilis complete genome (section 17 of 21)similar to glycine cleavage system protein H
Contig364D	26753150_f2_105	2709	5546	336	112	295	3.40E-26	Saccharomyces cerevisiae	P36078	YKL084WWhypothetical protein YKL084wS.cerevisiae chromosome X1 reading frame ORF YKL084w. ORF YKL084w
Contig364D	26757807_f3_246	2710	5547	951	317	1619	1.70E-166	Staphylococcus epidermidis	e255529	lipoproteinS.epidermidis gene encoding ABC transport system.
Contig364D	26834387_f2_135	2711	5548	711	237	115	9.70E-07	Lactococcus lactis	g3043880	transmembrane protein Tmp6Lactococcus lactis transmembrane protein Tmp6 gene, partial cds.identified as a fusion to a signal peptide-less
Contig364D	26839462_c2_383	2712	5549	1011	337	817	1.60E-81	Bacillus subtilis	e1186164	yvcKconserved hypothetical protein yvcKBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins
Contig364D	2752262_c2_366	2713	5550	1014	338	652	5.00E-64	Bacillus subtilis	g2293447	opuBAATPaseBacillus subtilis choline transport system including ATPase(opuBA), transmembrane protein (opuBB), choline binding proteinprecursor (opuBC) and transmembrane protein (opuBD) genes, completecds; and unknown gene.OpuBA; part of choline uptake sys
Contig364D	275268_c1_294	2714	5551	1125	375	773	7.50E-77	BACILLUS SUBTILIS	P17731	HISHPHOSPHATE TRANSAMINASE)
Contig364D	2917200_f2_146	2715	5552	192	64					

Contig364D	2926425_f3_204	2716	5553	960	320	456	2.90E-43	Bacillus subtilis	P39074	bmrUBmrUBacillus subtilis bmrU, multidrug efflux transporter (bmr) and its regulator (bmrR) genes, complete cds, and branched-chain 2-oxo acid dehydrogenase (bfnB) gene, 3' end.
Contig364D	29376503_f3_217	2717	5554	246	82					
Contig364D	29501510_c3_410	2718	5555	1125	375	432	1.00E-40	Bacillus subtilis	P27621	tagBin involved in polyglycerol phosphate teichoic acid biosynthesis tagBB.subtilis tagA, tagB, tagC and tagD genes, complete cds.putative
Contig364D	3001313_c1_310	2719	5556	681	227	154	3.00E-11	Escherichia coli	g1788628	hypothetical protein b2291Escherichia coli K-12 MG1655 section 208 of 400 of the complete genome.o199
Contig364D	30491275_c3_415	2720	5557	1104	368	391	2.30E-36	Bacillus subtilis	e1184961	ykvI conserved hypothetical protein ykvI Bacillus subtilis complete genome (section 8 of 21) similar to hypothetical proteins from B. subtilis
Contig364D	30601588_c2_337	2721	5558	834	278	561	2.20E-54	Bacillus subtilis	P42953	tagG highly hydrophobic integral membrane protein Bacillus subtilis 168 highly hydrophobic integral membrane protein (tagG) gene and ATP-binding protein (tagH) gene, complete cds.
Contig364D	30745328_c3_480	2722	5559	606	202	200	3.90E-16	Escherichia coli	g1790856	gpmB gpmB protein Escherichia coli K-12 MG1655 section 399 of 400 of the complete genome.Kenn Rudd identifies as gpmB
Contig364D	31257943_c1_267	2723	5560	414	138	669	7.90E-66	Staphylococcus aureus	g1913907	tagD TagD Staphylococcus aureus teichoic acid biosynthesis TagB gene, partial cds and TagX and TagD genes, complete cds.similar to Bacillus subtilis TagD
Contig364D	31267503_c1_270	2724	5561	813	271	784	5.10E-78	Bacillus subtilis	g2293177	ysrC transporter Bacillus subtilis rmb-dnaB genomic region.similar to ABC transporter (ATP-binding protein)
Contig364D	31289687_c3_456	2725	5562	681	227	134	4.70E-06	Schizosaccharomyces pombe	e334260	SPAC14C4.02 hypothetical protein S.pombe chromosome I cosmid c14C4.SPAC14C4.02c, unknown; SMC family; coiled coil,
Contig364D	31428188_f3_178	2726	5563	222	74					

Contig364D	31578_c1_312	2727	5564	537	179	463	5.30E-44	Bacillus subtilis	g2618861	yvoFputative acetyltransferaseBacillus subtilis 300-304 degree genomic sequence.similar to O-acetyltransferase
Contig364D	31803377_f1_66	2728	5565	612	204					ORF2Bacillus sp. Na+/H+ antiporter system responsible genes.Na+/H+ antiporter system responsible gene
Contig364D	32062553_c3_406	2729	5566	468	156	354	1.90E-32	Bacillus sp.	d1007182	YvrBputative hemin permease, YvrB fragment from yvsA to yvqA.similar to iron permease
Contig364D	32212902_c1_261	2730	5567	1035	345	468	1.60E-44	Bacillus subtilis	e1249808	YvrBputative hemin permease, YvrB fragment from yvsA to yvqA.similar to iron permease
Contig364D	32225012_f2_77	2731	5568	498	166	276	3.50E-24	Bacillus subtilis	e1181516	yknAYknABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.homologous to OsmC from Escherichia coli
Contig364D	32611068_c3_402	2732	5569	1674	558	1694	1.90E-174	Bacillus subtilis	e1186234	argSarginyl-tRNA synthetaseBacillus subtilis complete genome (section 20 of 21)
Contig364D	33210952_f3_168	2733	5570	234	78					
Contig364D	33239001_f3_158	2734	5571	276	92					
Contig364D	33414143_c2_354	2735	5572	1710	570	619	1.60E-60	Shigella flexneri	g2773332	cydCABC transporter CydCShigella flexneri ABC transporter CydC (cydC) gene, complete cds.similar to E. coli CydC
Contig364D	34160625_c2_341	2736	5573	438	146					
Contig364D	34173385_c3_422	2737	5574	621	207	151	6.10E-11	Pyrococcus horikoshii	d1028675	PHBQ005166aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1393354-1434541 nt position(complementary strand), clone
Contig364D	34173750_c2_389	2738	5575	480	160					
Contig364D	34189817_c3_408	2739	5576	2052	684	888	4.90E-89	Bacillus subtilis	e1186030	yvgPconserved hypothetical protein yvgPBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins
Contig364D	34261088_c2_353	2740	5577	312	104					

Contig364D	34562762_c2_326	2741	5578	750	250	230	2.60E-19	Pyrococcus horikoshii	d1027599	PHBH026232aa long hypothetical protein Pyrococcus horikoshii OT3 genomic DNA, 415465-442351 nt position (complementary strand), clone
Contig364D	34571000_f2_110	2742	5579	537	179	393	1.40E-35	Entamoeba histolytica	Q24803	ADH2alcohol dehydrogenase 2Entamoeba histolytica HM1The derived amino acid sequence of EhADH2 is
Contig364D	34589027_c1_283	2743	5580	315	105					
Contig364D	34612887_f3_221	2744	5581	465	155	260	1.70E-22	Bacillus subtilis	e1181515	ykmAYkmABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR similar to hypothetical proteins
Contig364D	34627136_f1_3	2745	5582	306	102					
Contig364D	34641875_c2_359	2746	5583	939	313	704	1.50E-69	Bacillus subtilis	e1185029	fruBfructose-1-phosphate kinaseBacillus subtilis complete genome (section 8 of 21)
Contig364D	34642567_c3_472	2747	5584	2406	802	2175	1.70E-228	Bacillus subtilis	e1186049	yvaJconserved hypothetical protein yvaJBacillus subtilis complete genome (section 18 of 21) similar to hypothetical proteins
Contig364D	34645311_f1_62	2748	5585	525	175	135	3.00E-09	Escherichia coli	P46854	YHHYhypothetical protein b3441Escherichia coli K-12 MG1655 section 310 of 400 of the complete genome.o162
Contig364D	35166012_c3_432	2749	5586	210	70					
Contig364D	35444127_f3_192	2750	5587	663	221	514	2.10E-49	Bacillus subtilis	g1762328	yvhKYcr59c/YigZ homologBacillus subtilis putative transcriptional regulator (yvhJ), Ycr59c/YigZ homolog (yvhK), histidine kinase (degS), transcriptional regulator of degradation enzyme (degU), (degV), (comFA), (comFB), (comFC), flagellar protein (yviB), negat
Contig364D	35943277_c2_377	2751	5588	1065	355	1275	4.80E-130	Bacillus subtilis	g2331287	prfBrelease factor 2Bacillus subtilis release factor 2 (prfB) gene, complete cds.orf3



Contig364D	36131311_c2_374	2752	5589	696	232	194	1.70E-15	Bacillus subtilis	g451867	Bacillus subtilis (clones pDM116 and pDM113) flagellin synthesis regulatory protein (flgM) and flagellar hook-filament junction protein (flgK) genes and orf139, orf160, orfX, complete cds's in Z18629, ORFX is called comForf3; ORFX; putative
Contig364D	36133385_c2_345	2753	5590	681	227	203	1.90E-16	Bacillus subtilis	e1182699	yet1 hypothetical protein yet1 Bacillus subtilis complete genome (section 4 of 21)
Contig364D	36212541_c1_299	2754	5591	204	68					
Contig364D	36229676_c3_404	2755	5592	795	265	238	3.70E-20	Acinetobacter sp. ADP1	g3172115	pcaD beta-ketoadipate enol-lactone hydrolase Acinetobacter sp. ADP1 pca-qui-pob supraoperonic cluster, complete sequence. ELH
Contig364D	36230252_c3_434	2756	5593	777	259	480	8.40E-46	Bacillus subtilis	e1185028	fruR transcriptional regulator (DeoR family) Bacillus subtilis complete genome (section 8 of 21)
Contig364D	36601562_c2_357	2757	5594	1182	394	1669	8.50E-172	Staphylococcus aureus	P21191	norA ORF for norA. aureus norA gene.
Contig364D	390942_c1_318	2758	5595	456	152	112	7.30E-06	Kinetoplast Leishmania tarentolae	g896286	MURF1 Leishmania tarentolae kinetoplast pre-edited mitochondrial maxicircle DNA complete transcribed region and flanks. NH2 terminus uncertain
Contig364D	391527_f1_65	2759	5596	930	310	700	4.10E-69	Bacillus subtilis	P42954	tagH ATP-binding protein Bacillus subtilis 168 highly hydrophobic integral membrane protein (tagG) gene and ATP-binding protein (tagH) gene, complete cds.
Contig364D	3928762_f3_167	2760	5597	1368	456	839	7.60E-84	Bacillus subtilis	e1185983	yubG Na <sup>+</sup> -transporting ATP synthase homolog yubG Bacillus subtilis complete genome (section 16 of 21) similar to Na <sup>+</sup> -transporting ATP synthase
Contig364D	3942263_c2_348	2761	5598	726	242	913	1.10E-91	Bacillus subtilis	e1182664	yeel conserved hypothetical protein yeel Bacillus subtilis complete genome (section 4 of 21) similar to hypothetical proteins

Contig364D	3953452_c1_285	2762	5599	507	169	328	1.10E-29	Bacillus subtilis	e1183226	yjdtranscription regulation homolog yjdIBacillus subtilis complete genome (section 7 of 21)similar to transcription regulation
Contig364D	3962915_f3_218	2763	5600	627	209	137	4.00E-08	Synechocystis sp.	d1011025	hypothetical proteinSynecocystis sp. PCC6803 complete genome, 21/27, 2644795-2755702. ORF ID
Contig364D	39818_f3_229	2764	5601	240	80	234	9.80E-20	Staphylococcus aureus	g1575061	scdAScdAStaphylococcus aureus scdA gene, complete cds.S. aureus cells containing a scdA disruption have
Contig364D	4023518_f3_177	2765	5602	909	303	579	2.70E-56	Bacillus subtilis	e1182841	yfhFYfhFBacillus subtilis complete genome (section 5 of 21)similar to cell- division inhibitor
Contig364D	4036093_c2_350	2766	5603	864	288	461	8.70E-44	Bacillus subtilis	e1181918	ykuMYkuM proteinBacillus subtilis 29kB DNA fragment from ykwC gene to cseI5 gene.homologous to LysR type transcriptional regulators
Contig364D	4072006_f1_53	2767	5604	201	67					
Contig364D	4095055_f3_202	2768	5605	894	298	258	2.80E-22	Sphingomonas S88	g1314584	unknownSphingomonas S88 sphingan polysaccharide synthesis (spsG), (spsS)(spsR), glycosyl transferase (spsQ), (spsI), glycosyl transferase(spsK), glycosyl transferase (spsL), (spsJ), (spsF), (spsD),(spsC), (spsE), Urf 32, Urf 26, ATP binding cassette tran
Contig364D	4096093_c2_395	2769	5606	354	118	155	2.30E-11	Paracoccus denitrificans	B42573	urf120
Contig364D	4100093_c2_363	2770	5607	1161	387	489	9.40E-47	Helicobacter pylori	g2313385	HP0293para-aminobenzoate synthetase (pabB)Helicobacter pylori section 25 of 134 of the complete genome.similar to EGAD
Contig364D	4103393_c1_290	2771	5608	597	199	436	3.90E-41	Salmonella typhimurium	P06193	PABA pabA proteinSalmonella typhimurium pabA gene for para- aminobenzoate synthaseglutamine amidotransferase:glutamine amidotransferasepabA gene product (aa 1- 187)
Contig364D	4110888_c2_347	2772	5609	405	135					

Contig364D	4111691_c3_441	2773	5610	744	248	351	1.20E-31	Bacillus subtilis	P42967	ycsJ urea amidolyase Bacillus subtilis genome around 39 degrees region encoding 17 ORFs, complete cds. similar to allophanate hydrolase
Contig364D	4195817_c3_412	2774	5611	1743	581	2597	3.90E-270	Staphylococcus aureus	e264711	abcA ATP-binding cassette transporter AS. aureus abcA, ppp4, and tagD genes.
Contig364D	42167_c3_414	2775	5612	834	278	834	2.60E-83	Bacillus subtilis	P49938	fluC ferrichrome transport protein, FluCBacillus subtilis 42.7kB DNA fragment from yvsA to yvqA, protein-dependent
Contig364D	422162_f1_36	2776	5613	456	152	439	1.90E-41	Bacillus subtilis	e1184963	ykvK6-pyruvoyl tetrahydrobiopterin synthase homolog ykvKBacillus subtilis complete genome (section 8 of 21) similar to 6-pyruvoyl tetrahydrobiopterin synthase
Contig364D	422800_f1_71	2777	5614	447	149	542	2.30E-52	Staphylococcus aureus	g84950	sarA staphylococcal accessory regulator AS. aureus sarA staphylococcal accessory regulator A (sarA) gene, complete cds.
Contig364D	429675_f3_238	2778	5615	216	72					
Contig364D	4461693_f3_254	2779	5616	240	80					
Contig364D	4487588_f1_38	2780	5617	609	203					
Contig364D	4501250_c3_477	2781	5618	1080	360	871	3.10E-87	Bacillus stearothermophilus	d1020364	membrane protein Bacillus stearothermophilus DNA for glycogen operon, complete cds. The ORF is similar to the Alkaligenes eutrophus
Contig364D	4511550_c1_303	2782	5619	1278	426	318	1.20E-28	Escherichia coli	P23524	yhaD hypothetical 42.1 kD protein in mpB-sohA Escherichia coli K-12 MG1655 section 284 of 400 of the complete genome. f408; 100 pct identical amino acid sequence and
Contig364D	4535652_f2_142	2783	5620	225	75					
Contig364D	4539143_c3_462	2784	5621	942	314	970	1.00E-97	Bacillus subtilis	g2618857	pisK HPr(Ser) kinase Bacillus subtilis 300-304 degree genomic sequence. similar to the Mycoplasma genitalium hypothetical
Contig364D	4578956_f2_91	2785	5622	297	99					
Contig364D	4689077_c1_315	2786	5623	333	111	466	2.60E-44	Bacillus subtilis	g2668494	clpPClpP Bacillus subtilis Clp protease proteolytic component (clpP) gene, complete cds. proteolytic component of Clp protease

Contig364D	4689130_f3_256	2787	5624	306	102							ymaA YmaAB subtilis cwlC, nrdE, nrdF, ymaA and ymaB genes.similar to ribonucleoprotein
Contig364D	4703180_c3_450	2788	5625	453	151	251	1.60E-21	Bacillus subtilis	P50618			
Contig364D	4726527_f1_32	2789	5626	528	176	749	2.60E-74	Bacillus subtilis	e1184965			ykvM conserved hypothetical protein ykvMBacillus subtilis complete genome (section 8 of 21)similar to hypothetical proteins
Contig364D	4773392_f3_161	2790	5627	288	96							
Contig364D	4775287_c2_364	2791	5628	1008	336	238	1.10E-34	Escherichia coli	P75745			YBGKhypothetical protein b0712Escherichia coli K-12 MG1655 section 64 of 400 of the completegenome.o310; This 310 aa ORF is 48 pct identical (1 gap)
Contig364D	4804643_f2_89	2792	5629	246	82							
Contig364D	4806575_c1_272	2793	5630	651	217	503	3.10E-48	Bacillus subtilis	e1181486			ykaa YkaABacillus subtilis 168 56 kb DNA fragment between xlyA and ykoR.
Contig364D	4876077_f1_37	2794	5631	714	238	778	2.20E-77	Bacillus subtilis	e1184964			ykvLcoenzyme PQQ synthesis homolog ykvLBacillus subtilis complete genome (section 8 of 21)similar to coenzyme PQQ synthesis
Contig364D	4885876_c3_466	2795	5632	918	306	829	8.80E-83	Bacillus subtilis	O06973			yvcJhypothetical proteinBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins
Contig364D	4892878_c2_338	2796	5633	1077	359	455	3.80E-43	Staphylococcus aureus	g1913906			tagXTagXStaphylococcus aureus teichoic acid biosynthesis TagB gene, partialcds and TagX and TagD genes, complete cds.
Contig364D	4898376_f3_244	2797	5634	207	69							
Contig364D	5084652_f1_56	2798	5635	507	169	536	9.80E-52	Staphylococcus aureus	g1575061			scdAScdAStaphylococcus aureus scdA gene, complete cds.S. aureus cells containing a scdA disruption have
Contig364D	5131265_c1_300	2799	5636	276	92							
Contig364D	5182962_f2_119	2800	5637	1068	356	295	1.10E-30	Bacillus subtilis	P35164			resEtwo-component sensor histidine kinaseBacillus subtilis spoVA to serA region.ORFX18
Contig364D	5195393_c2_334	2801	5638	654	218	1088	3.10E-110	Staphylococcus epidermidis	e255543			sirRputative iron dependant repressorS.epidermidis sirR gene.

Contig364D	5276677_c3_444	2802	5639	1566	522	703	2.00E-69	Helicobacter pylori	g2313949	HP0818osmoprotection protein (proWX)Helicobacter pylori section 71 of 134 of the complete genome.similar to EGAD
Contig364D	5283592_f2_126	2803	5640	288	96					enoenolaseStaphylococcus aureus enolase (eno) gene, complete cds.ENO; laminin binding protein
Contig364D	5292175_c2_388	2804	5641	1323	441	2112	9.70E-219	Staphylococcus aureus	g3152725	
Contig364D	53552_f3_194	2805	5642	660	220	179	6.60E-14	Bacillus firmus	Q45133	grpBglutamate-rich proteinBacillus firmus OrfA, OrfB, glutamate-rich protein (grpA), OrfC, and glutamate-rich protein (grpB) genes, complete cds.
Contig364D	535325_c2_373	2806	5643	888	296	526	1.10E-50	Bacillus subtilis	P32436	degUorf3U3B.subtilis comF gene.alternate gene name
Contig364D	5367843_c2_391	2807	5644	759	253	791	9.30E-79	Bacillus stearothermophilus	Q06174	ESTesteraseBacillus stearothermophilus esterase gene.
Contig364D	5869702_f3_253	2808	5645	309	103					
Contig364D	5938762_c3_428	2809	5646	1704	568	566	6.50E-55	Haemophilus influenzae	P45082	H11157transport ATP-binding protein (cydD)Haemophilus influenzae from bases 1218795 to 1228832 (section 110of 163) of the complete genome.unassigned ATP-binding cassette proteinssimilar to GB
Contig364D	6051500_c3_420	2810	5647	189	63					
Contig364D	6051537_c3_460	2811	5648	276	92	112	8.30E-07	Bacillus subtilis	P37953	csbACsbABacillus subtilis 300-304 degree genomic sequence.putative membrane protein; putative
Contig364D	6053176_f2_118	2812	5649	519	173					
Contig364D	6053540_c3_458	2813	5650	198	66					
Contig364D	6257763_c2_385	2814	5651	660	220	187	2.40E-13	Kaposi's sarcoma-associated herpesvirus	g2246532	Kaposi's sarcoma-associated herpesvirus glycoprotein M, DNA replication protein, glycoprotein, DNA replication protein, FLICEinhibitory protein and v-cyclin genes, complete cds, and tegumentprotein gene, partial cds.ORF 73, contains large complex repeat CR

Contig364D	626592_c3_403	2815	5652	852	284	233	1.30E-19	Archaeoglobus fulgidus	g2648849	AF17062-hydroxy-6-oxo-6-phenylhexa- 2,4-dienoic acidArchaeoglobus fulgidus section 121 of 172 of the complete genome.similar to GP
Contig364D	6437525_f1_60	2816	5653	294	98					
Contig364D	6440640_c2_346	2817	5654	1278	426					
Contig364D	6642827_c2_329	2818	5655	2403	801	1527	9.50E-157	Bacillus subtilis	e1184238	yufTunknownBacillus subtilis complete genome (section 17 of 21)similar to NADH dehydrogenase
Contig364D	6680312_f3_223	2819	5656	714	238	208	5.60E-17	Caenorhabditis elegans	g1825636	ZK354.3Caenorhabditis elegans cosmid ZK354.
Contig364D	6681577_c3_483	2820	5657	432	144	277	2.70E-24	Bacillus subtilis	e1184356	yusFhypothetical protein yusFBacillus subtilis complete genome (section 17 of 21)
Contig364D	6822175_c1_293	2821	5658	1914	638	1229	3.60E-125	Bacillus subtilis	g2619051	yocIRecQ homologBacillus subtilis chromosome region between terC and odhAB.similar to E.coli RecQ protein (607 aa)
Contig364D	6823453_c2_331	2822	5659	483	161	123	5.70E-08	Pyrococcus horikoshii	d1028563	PHCC005174aa long hypothetical proteinPyrococcus horikoshii OT3 genomic DNA, 1300517-1338254 nt position, clone
Contig364D	6829638_c2_356	2823	5660	186	62					
Contig364D	6833313_c2_343	2824	5661	1920	640	550	3.20E-53	Bacillus subtilis	g2293178	ytsDYsDBacillus subtilis rmb-dnaB genomic region.similarity to NADH dehydrogenase
Contig364D	7239188_f3_224	2825	5662	675	225	491	5.70E-47	Bacillus subtilis	e1186152	yvdDHypothetical proteinBacillus subtilis complete genome (section 18 of 21)similar to hypothetical proteins
Contig364D	7800_c3_474	2826	5663	198	66					
Contig364D	788950_c2_332	2827	5664	531	177	219	3.80E-18	Bacillus subtilis	e1184243	yufBunknownBacillus subtilis complete genome (section 17 of 21)similar to hypothetical proteins
Contig364D	821963_c1_269	2828	5665	546	182					
Contig364D	867260_f1_48	2829	5666	225	75					
Contig364D	899177_c2_325	2830	5667	930	310	596	4.30E-58	Bacillus subtilis	e1249807	yvrCPutative metal binding protein, YvrCBacillus subtilis 42.7kB DNA fragment from yvsA to yvqA.similar to iron-binding protein
Contig364D	900256_c3_440	2831	5668	210	70					

Contig364D	9642_f2_131	2832	5669	876	292	769	2.00E-76	Bacillus subtilis	e1185988	yubBbacitracin resistance protein (undecapreno) homolog yubB Bacillus subtilis complete genome (section 16 of 21) similar to bacitracin resistance protein
Contig364D	969075_c3_482	2833	5670	354	118	359	5.60E-33	Bacillus subtilis	e1184359	yusarsenate reductase homolog yusB Bacillus subtilis complete genome (section 17 of 21) similar to arsenate reductase
Contig364D	970327_c1_323	2834	5671	297	99	167	1.20E-12	Bacillus subtilis	e1184355	yusE thioredoxin homolog yusE Bacillus subtilis complete genome (section 17 of 21) similar to thioredoxin
Contig364D	978426_c3_452	2835	5672	978	326	960	1.10E-96	Bacillus subtilis	e1182347	yolN homologue of ferric anguibactin transport system Bacillus subtilis complete genome (section 3 of 21) similar to ferrichrome ABC transporter (permease)
Contig364D	9882950_c1_288	2836	5673	1350	450	1090	1.90E-110	Bacillus subtilis	e1182956	yhdP hypothetical protein Bacillus subtilis complete genome (section 6 of 21) similar to hemolysin
Contig364D	9884625_f3_203	2837	5674	1509	503	1226	7.50E-125	Bacillus subtilis	P94408	yclIF homologue of Di-tripeptide transporter Dtp of L. Bacillus subtilis complete genome (section 3 of 21) similar to di-tripeptide ABC transporter (membrane)